“ADATTAMENTO URBANO AI CAMBIAMENTI CLIMATICIE GESTIONE IDRICA: NUOVI APPROCCI PER UNA CITTÀ RESILIENTE, SOSTENIBILE, INCLUSIVA”

(ADAPTACIÓN URBANA AL CAMBIO CLIMÁTICO Y GESTIÓN DEL AGUA: NUEVOS ENFOQUES PARA UNA CIUDAD RESILIENTE, SOSTENIBLE E INCLUSIVA)

Guido Emilio Rossi

Seminario de Urbanismo Internacional

UNIVERSIDAD AUTÓNOMA METROPOLITANA
Dr. Eduardo Abel Peñalosa Castro
Rector General

UNIDAD AZCAPOTZALCO
Dr. Óscar Lozano Carrillo
Rector de la Unidad Azcapotzalco
Dr. Marco Vinicio Ferruzca Navarro
Director de la División de Ciencias y Artes para el Diseño
Mtro. Salvador Ulises Islas Barajas
Secretaria Académico
Mtro. Miguel Toshihiko Hirata Kitahara
Jefe encargado del Departamento de Evaluación del Diseño en el Tiempo
Dra. Elizabeth Espinosa Dorantes
Jefa del Área de Arquitectura y Urbanismo Internacional
Dr. Sergio Padilla Galicia
Coordinador General del Seminario de Urbanismo Internacional

Dra. Elizabeth Espinosa Dorantes
Dra. Maruja Redondo Gómez
Mtro. Alejandro Hurtado Farfán
DG. Karen Jazmín Valdez Angeles
Coordinación Ejecutiva

DG. Karen Jazmín Valdez Angeles
Formación y diseño

15° Seminario de Urbanismo Internacional
Universidad Autónoma Metropolitana-Azcapotzalco
Av. San Pablo No. 180, Col. Reynosa Tamaulipas.
Del. Azcapotzalco 02200, Ciudad de México.
Tel: 53 18 91 79 / 53 18 91 80

aaui.azc.uam.mx
www.suiuam.com
Abril de 2019

GUIDO EMILIO ROSSI

Italia

Arquitecto, y candidato a doctor por la Universidad de Génova, Escuela Politécnica, Departamento de Arquitectura y Diseño (dAD), Génova (Italia). Especialista en "Arquitectura Bio-ecológica" (arquitectura orgánica y sustentable) y Maestro en Arquitectura y Planeamiento Urbano en la Università degli Studi di Genova, Facultad de Arquitectura, Génova, Italia

Es profesor asistente en la Universidad de Génova, Escuela Politécnica, en el Departamento de Arquitectura y Diseño en el curso “Laboratorio di progettazione architettonica 3” (3rd curso de diseño arquitectónico). Recientemente ha sido profesor invitado en la Florida International University, College of Architecture + The Art de Miami Beach Urban Studios, Sea level solution centre, Miami, Florida, Estados Unidos de América.

Desde el año 2005 trabaja como arquitecto y planificador urbano independiente o asociado con otras firmas en la realización de proyectos en Italia y China. Tiene el registro y certificación para la práctica como Arquitecto en Italia. Especialista en el sector de Construcciones sustentables y orgánicas.

En los últimos años destaca su participación profesional en: consultoría y gerencia de proyectos de desarrollo nacional en la Unión Europea; como experto asesor externo en la coordinación de proyectos del – URBACT III – 2nd Change, Waking up the “sleeping giants” y del Erasmus Mundus Joint Doctoral Programme in Interactive and Cognitive Environments (EMJD ICE) de la Universidad de Génova, Escuela Politécnica de Arquitectura, Dep. de Arquitectura y Diseño (dAD), Génova, Italia.

ADAPTACIÓN URBANA AL CAMBIO CLIMÁTICO Y GESTIÓN DEL AGUA: NUEVOS ENFOQUES PARA UNA CIUDAD RESILIENTE, SOSTENIBLE E INCLUSIVA

Guido Emilio Rossi

Los impactos del cambio climático, el crecimiento demográfico urbano y los problemas sociopolíticos constituyen presiones que exacerban la vulnerabilidad de las ciudades. Las ciudades contribuyen y al mismo tiempo son víctimas del cambio climático (Grimm et al., 2008), desempeñan un papel clave en el tratamiento de las preocupaciones y problemas ecológicos globales y su transición a los objetivos de sostenibilidad se está volviendo crucial (Geels, 2011).

Para hacer frente a las amenazas que enfrentan, las ciudades están necesariamente involucradas en la mejora de su resistencia y en un número cada vez mayor se han embarcado en el camino de la adaptación al cambio climático con el fin de aumentar la resiliencia.

Enfoques de adaptación

La adaptación presupone una transformación que involucra todos los aspectos de la estructura (física y de otro tipo) de la vida urbana. El proceso de transición hacia una mayor sostenibilidad urbana es, por lo tanto, complejo y requiere largos tiempos y soluciones sistémicas bajo un enfoque multidisciplinario.

La adaptación puede llevarse a cabo a través de diferentes acciones y estrategias; la adaptación transformativa es la que requiere más recursos y más tiempo de implementación, pero también garantiza una mayor flexibilidad y resiliencia.

De todos los sistemas ambientales, el agua es aquel en el que el cambio climático se manifiesta de una manera más dramática e incisiva . La gestión urbana del agua es, por lo tanto, uno de los principales elementos de la transición hacia una mayor capacidad de recuperación.

El proceso de transformación hacia la adaptación lleva a la generación de productos / proyectos que, en la gestión de los recursos hídricos urbanos, se realizan principalmente en infraestructuras destinadas a amortiguar o responder a los impactos.

El enfoque convencional típico de la historia reciente, que implica el uso de soluciones técnicas, a menudo se ha ocupado de la gestión urbana del agua (y no) a través de sistemas tradicionales o infraestructura gris (IG) con numerosas consecuencias ambientales y económicas. Un enfoque alternativo, más holístico y eco céntrico propone una mayor armonización entre el diseño, el funcionamiento y la función de las infraestructuras artificiales y el diseño espacial en las zonas urbanas. En el debate contemporáneo sobre planificación urbana y en el campo de la gestión del agua, estamos presenciando un creciente interés en maximizar los beneficios de usar la naturaleza como una infraestructura que involucra el uso de infraestructuras azules / verdes (BGI).

Ante el surgimiento de la cuestión ambiental, la conciencia del límite de recursos y la creciente urbanización, ¿cuál es el papel del uso de la naturaleza como infraestructura en la producción de nuevos enfoques para el espacio urbano?

Transformación urbana hacia la adaptación

Las transiciones hacia la sostenibilidad son procesos complejos y de largo plazo que incluyen múltiples actores (Geels, 2011) e involucran necesariamente las interacciones entre tecnología, política / poder / política, economía / negocios / mercados y cultura / opinión pública (Geels, 2011).

Para lograr una gestión sostenible de los recursos hídricos urbanos (Sustainable Urban Water Management - SUWM), Wong y Brown (2009) subrayaron que las ciudades deben dar importancia al agua en el desarrollo urbano integrando el proceso de diseño urbano con otras disciplinas. responsable de la provisión de servicios de agua; Las ciudades también deben desarrollar capital político social para interactuar con el agua (Wong, Brown 2009). Además de proporcionar espacios recreativos, los paisajes urbanos también deben tener funciones ecológicas que faciliten procesos hidrológicos como la evaporación, la transpiración, la infiltración y la detención (Wong y Brown, 2009). Muchas ciudades carecen de las habilidades y capacidades organizativas necesarias para combinar resistencia y resiliencia climática con objetivos de sostenibilidad adicionales (Liu y Jensen 2017).

La descripción del nivel de transformación hacia la resiliencia puede basarse en la estructura formulada por R.R. Brown en el marco de transición hacia ciudades sensibles al agua - Transition framework towards water sensitive cities - que identifica 6 etapas que describen el grado de transición y avance de las ciudades desde la ciudad de suministro de agua - Water supply city -, pasando por la ciudad alcantarillada - Sewered city, la ciudad drenada - Drained city, la ciudad de las vías fluviales - Waterways city y la ciudad del ciclo del agua - Water cycle city, hasta la ciudad sensible al agua - Water sensitive city - hacia la sostenibilidad urbana. Este marco de transición de agua - water transitions framework - se desarrolló en Australia y se propone como una herramienta conceptual para analizar el desarrollo de la política de transición de agua urbana y el análisis de evaluación comparativa - benchmarking - a escala urbana.

Ejemplos: Rotterdam, Génova, Miami

Para investigar cómo las ciudades se están adaptando al cambio climático y cómo se lleva a cabo la transición a ciudades más sostenibles e inclusivas, se presentan ejemplos de tres ciudades que históricamente tienen una relación significativa y privilegiada con el agua y el mar, ciudades que, por diferentes razones, se enfrentan a emergencias relacionadas con la gestión de los recursos hídricos.

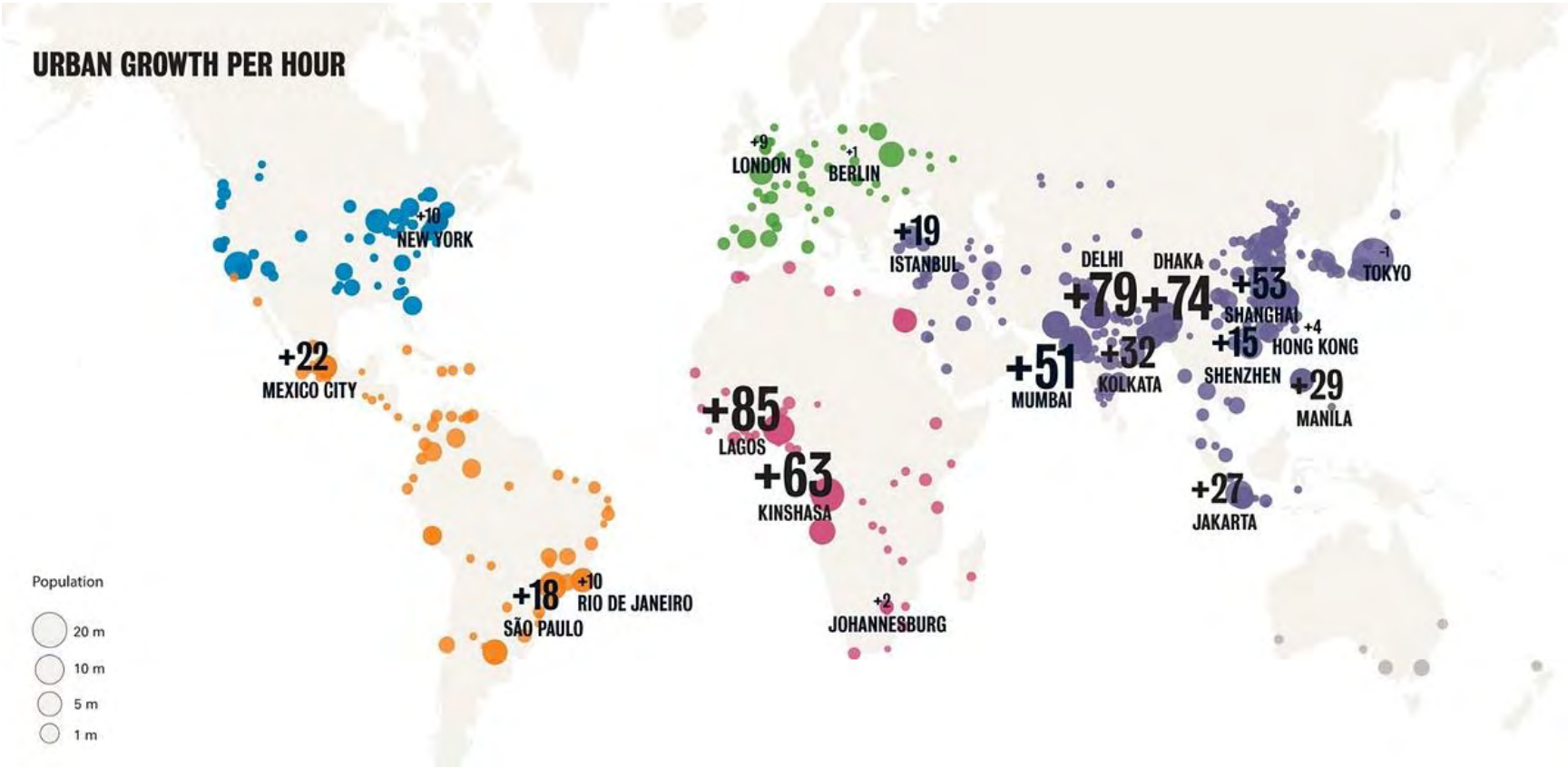
Las dos primeras ciudades seleccionadas son miembros de la red de 100 ciudades resilientes, fundadas con el objetivo de ayudar a las ciudades de todo el mundo a construir resiliencia a los crecientes desafíos sociales, económicos y físicos del siglo XXI. Rotterdam (Países Bajos) es conocida como una ciudad "de vanguardia" al enfrentar el camino de la transformación y tiene una competencia reconocida en términos de sostenibilidad y gestión del agua urbana. Miami (EE. UU.) es relevante por la gestión de los recursos hídricos, en particular con referencia a las habilidades en adaptación al nivel del mar (SLR). Génova (Italia) está "menos avanzada", pero ha tenido que enfrentar impactos catastróficos en los últimos años en términos de gestión de recursos hídricos y, por lo tanto, la necesidad y la urgencia de implementar un proceso de transformación y/o ciertas prácticas implementadas o planificadas que pueden acelerar el camino de transición. Miami es una ciudad que se enfrenta a un camino hacia la adaptación y la resiliencia, aunque a menudo se implementan estrategias de adaptación incremental, que son efectivas por un tiempo limitado. Otras ciudades, como Copenhague y Rotterdam, están más adelantadas en el proceso y ya han alcanzado etapas de mayor sostenibilidad y resiliencia.

Conclusión

La adaptación al cambio climático y las presiones a las que están sometidas las ciudades puede convertirse en una oportunidad para un nuevo diseño urbano sostenible, resiliente e inclusivo.

El enfoque multidisciplinario que nos involucra como arquitectos, urbanistas, arquitectos paisajistas junto con ingenieros, operadores de transporte, tomadores de decisiones es fundamental tanto en el proceso como en el diseño de nuevos espacios urbanos que sean sostenibles, resilientes e inclusivos.

Oltre il 50% della popolazione mondiale vive in città[1], in Europa la percentuale supera il 70% e la tendenza generale è in crescita.



Estimated urban growth per hour through a combination of natural internal growth and migration in selected world cities.
Source: UN World Urbanisation Prospects 2014/LSE Cities

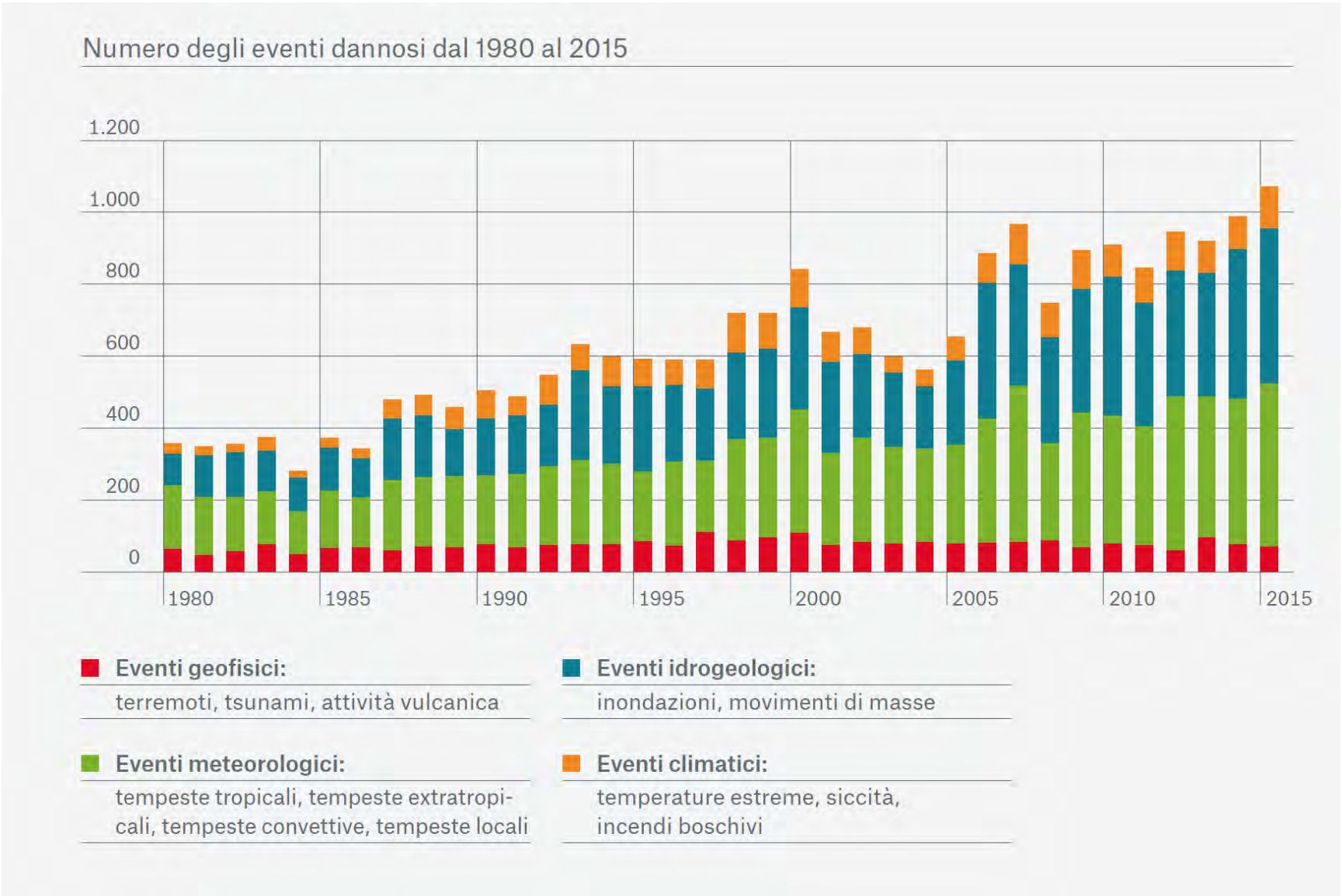
(1) UN-Habitat. 2016. “Urbanization and Development: Emerging Futures. World Cities Report 2016.” Nairobi, Kenya: UN-Habitat.

Gli impatti dei cambiamenti climatici, la crescita demografica urbana, le migrazioni e le questioni sociopolitiche costituiscono pressioni che acuiscono la vulnerabilità delle città.

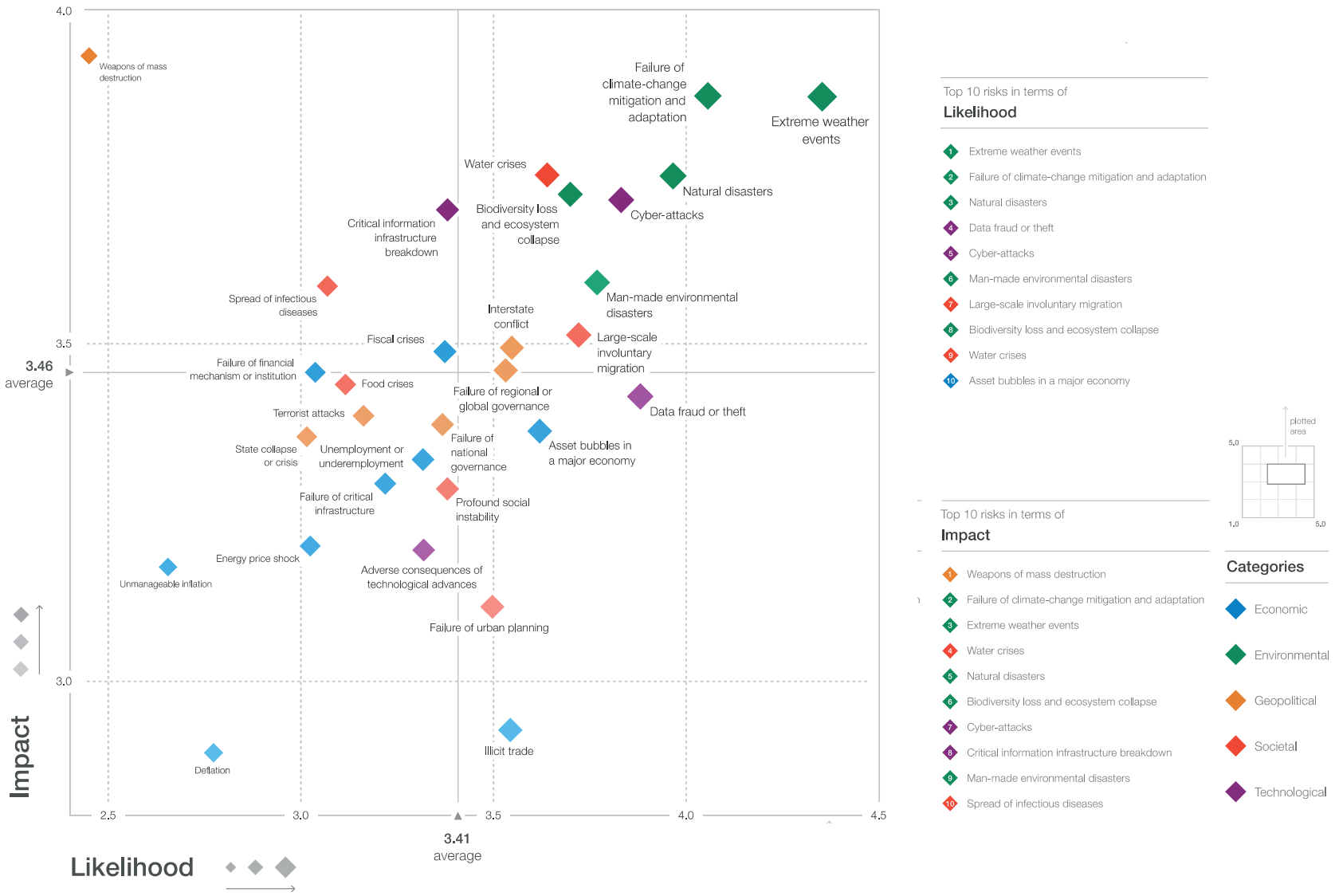
Le città sono sensibili agli estremi climatici a causa dell'accumulo di persone (densità di popolazione), infrastrutture, attività economiche e patrimonio culturale e, di conseguenza, contribuiscono e al contempo sono vittime del cambiamento climatico (2).

(2) Grimm, N. B., S. H. Faeth, N. E. Golubiewski, C. L. Redman, J. Wu, X. Bai, and J. M. Briggs. 2008. “Global Change and the Ecology of Cities.” Science 319 (5864): 756–60.

Il cambiamento climatico è una bufala
Source: Bennet, Chattanooga Times Free Press, U.S.A.

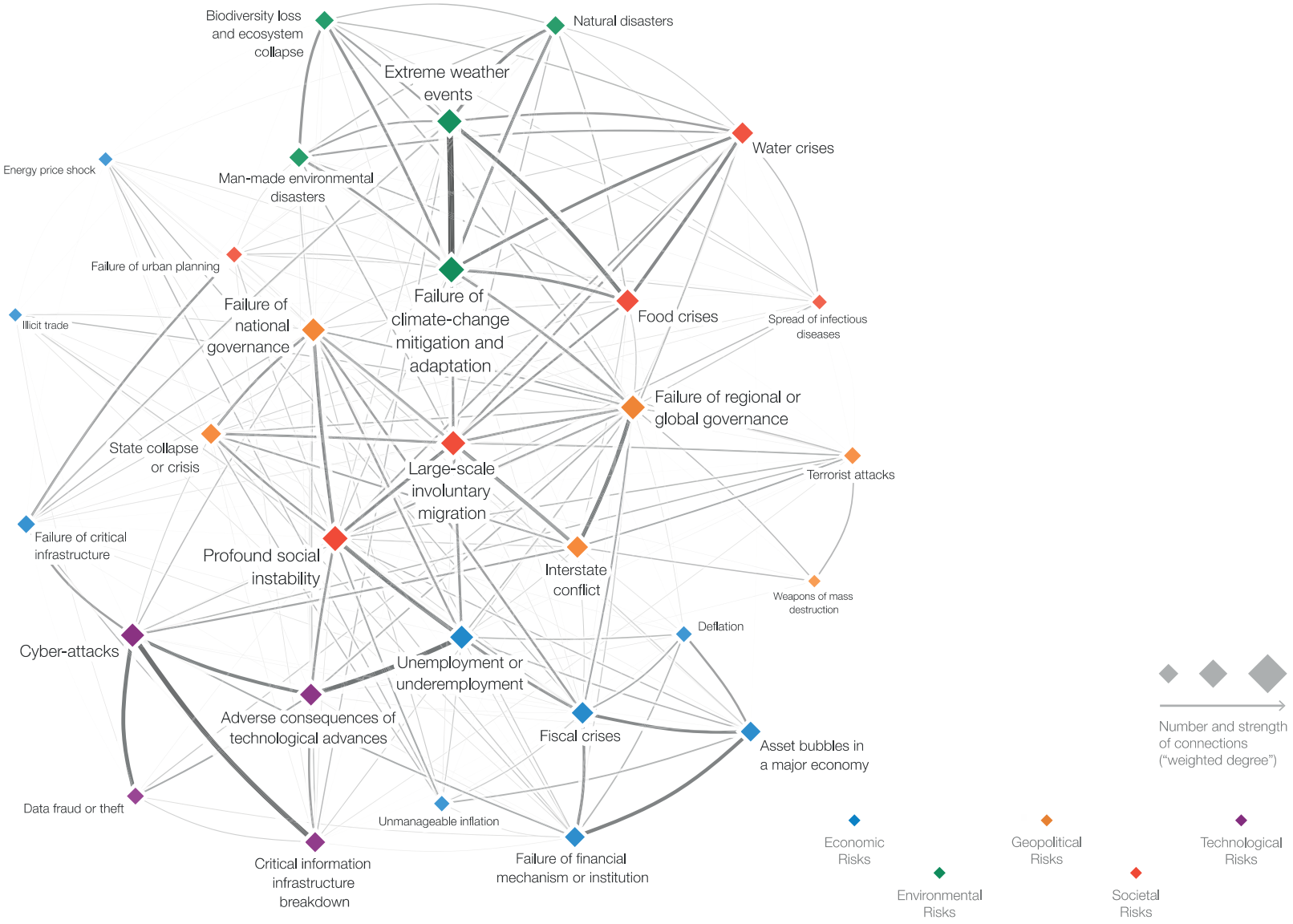


Munich RE – “Topics GEO, Le catastrofi naturali del 2015 - Analisi, valutazioni, posizioni”, Numero 2016



The Global Risks Landscape 2019 (Il panorama mondiale dei rischi 2019) - The Global Risks Report 2019

Source: World Economic Forum Global Risks Perception Survey 2018–2019. Edition



The Global Risks Interconnections Map 2019 - The Global Risks Report 2019

Source: World Economic Forum Global Risks Perception Survey 2018–2019. Edition

Arctic region
Temperature rise much larger than global average
Decrease in Arctic sea ice coverage
Decrease in Greenland ice sheet
Decrease in permafrost areas
Increasing risk of biodiversity loss
Some new opportunities for the exploitation of natural resources and for sea transportation
Risks to the livelihoods of indigenous peoples

Atlantic region
Increase in heavy precipitation events
Increase in river flow
Increasing risk of river and coastal flooding
Increasing damage risk from winter storms
Decrease in energy demand for heating
Increase in multiple climatic hazards

Mountain regions
Temperature rise larger than European average
Decrease in glacier extent and volume
Upward shift of plant and animal species
High risk of species extinctions
Increasing risk of forest pests
Increasing risk from rock falls and landslides
Changes in hydropower potential
Decrease in ski tourism

Coastal zones and regional seas
Sea level rise
Increase in sea surface temperatures
Increase in ocean acidity
Northward migration of marine species
Risks and some opportunities for fisheries
Changes in phytoplankton communities
Increasing number of marine dead zones
Increasing risk of water-borne diseases

Boreal region
Increase in heavy precipitation events
Decrease in snow, lake and river ice cover
Increase in precipitation and river flows
Increasing potential for forest growth and increasing risk of forest pests
Increasing damage risk from winter storms
Increase in crop yields
Decrease in energy demand for heating
Increase in hydropower potential
Increase in summer tourism

Continental region
Increase in heat extremes
Decrease in summer precipitation
Increasing risk of river floods
Increasing risk of forest fires
Decrease in economic value of forests
Increase in energy demand for cooling

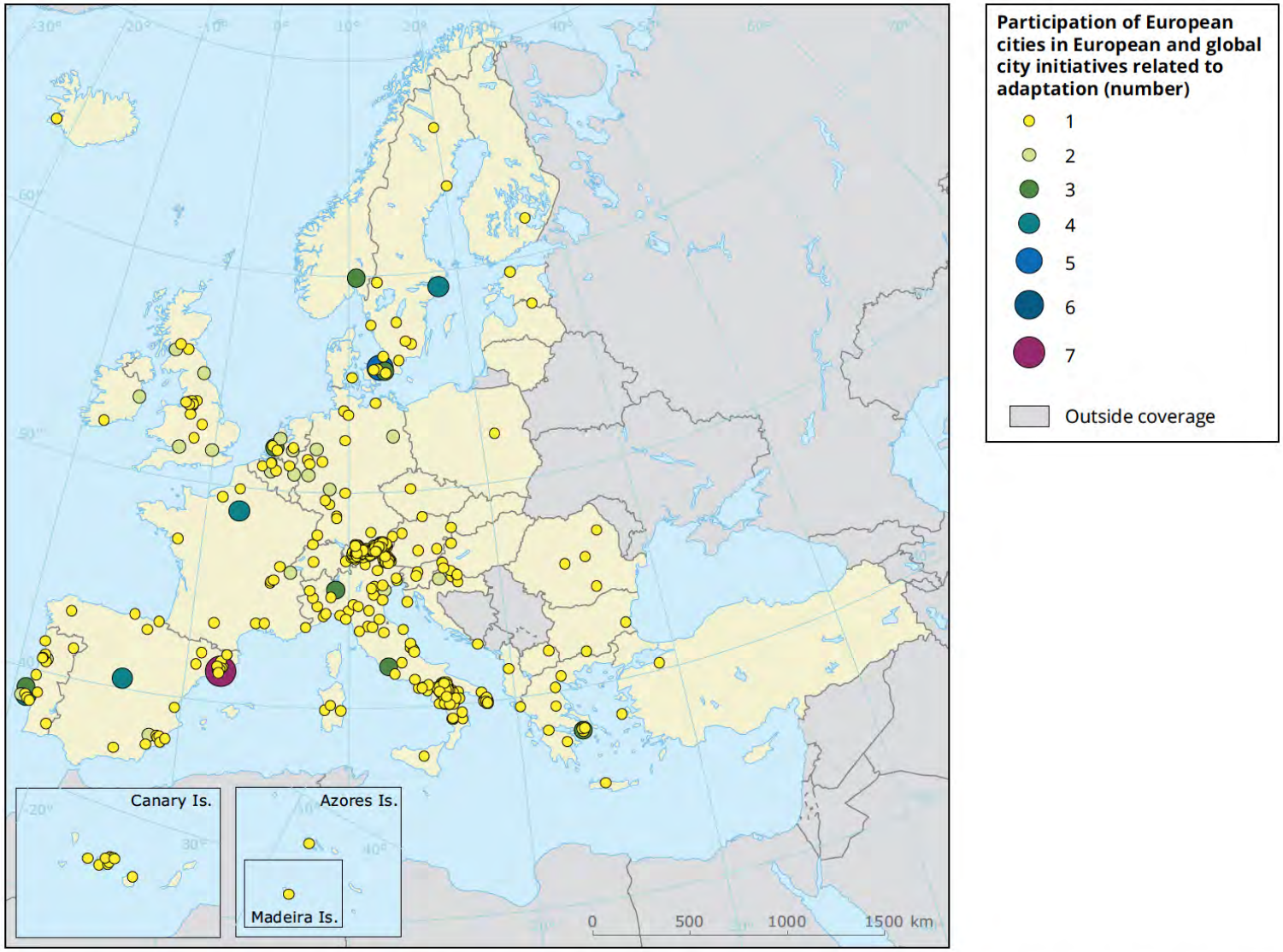
Mediterranean region
Large increase in heat extremes
Decrease in precipitation and river flow
Increasing risk of droughts
Increasing risk of biodiversity loss
Increasing risk of forest fires
Increased competition between different water users
Increasing water demand for agriculture
Decrease in crop yields
Increasing risks for livestock production
Increase in mortality from heat waves
Expansion of habitats for southern disease vectors
Decreasing potential for energy production
Increase in energy demand for cooling
Decrease in summer tourism and potential increase in other seasons
Increase in multiple climatic hazards
Most economic sectors negatively affected
High vulnerability to spillover effects of climate change from outside Europe

I principali cambiamenti climatici osservati e previsti, e I loro impatti per le regioni europee.
Source: EEA. 2017. Climate Change, Impacts and Vulnerability in Europe 2016: An Indicator-Based Report, European Environment Agency"

Mentre il mondo si urbanizza, le città giocano un ruolo chiave nell'affrontare le preoccupazioni e i problemi ecologici a livello globale e la transizione delle città verso la sostenibilità sta diventando cruciale. (3)

Per far fronte alle minacce che si trovano a contrastare, un numero sempre più crescente di città ha intrapreso il cammino verso l'adattamento ai cambiamenti climatici nell'ottica di incrementare la resilienza.

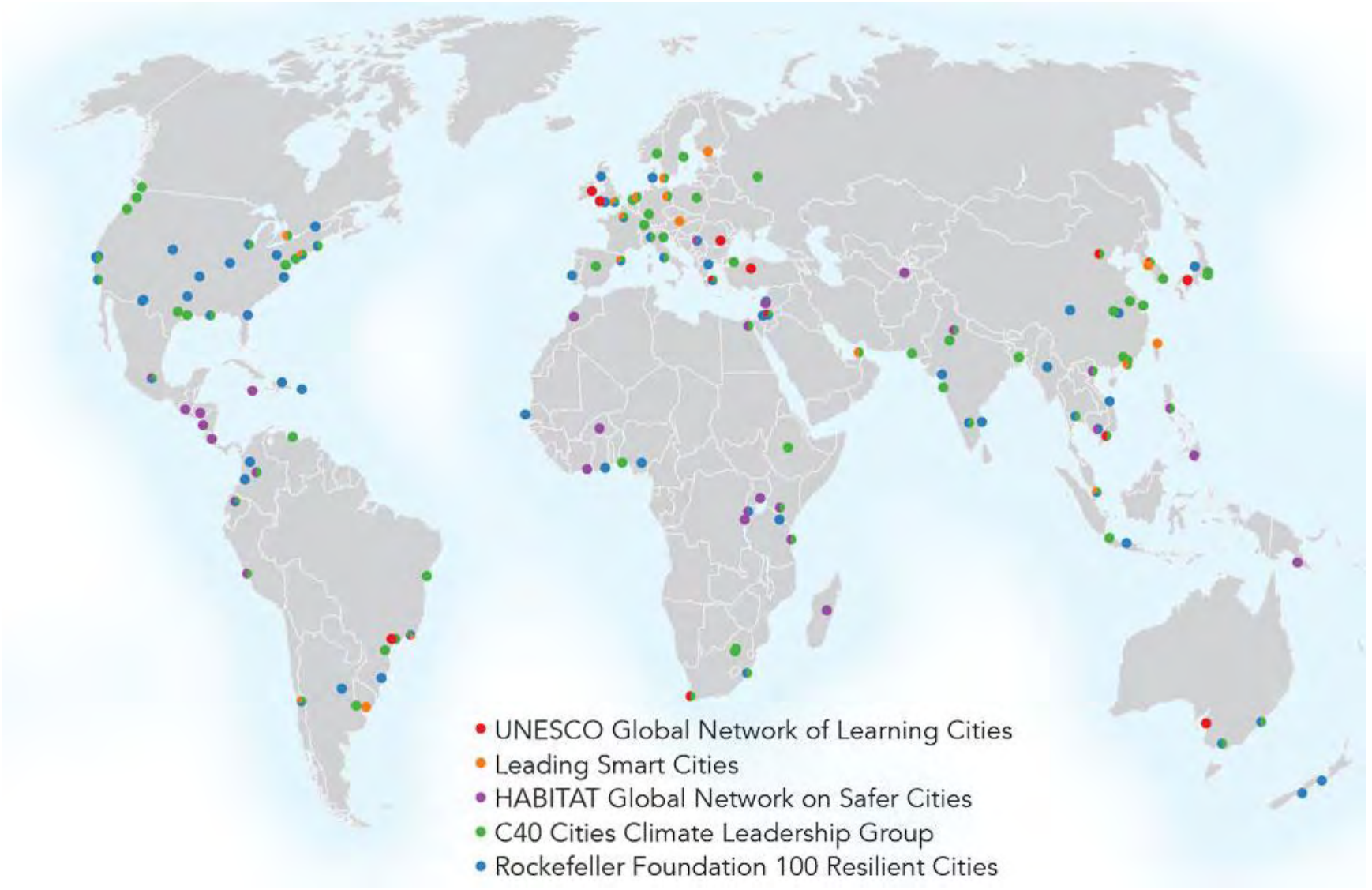
(3) Geels, Frank W. 2011. "The Multi-Level Perspective on Sustainability Transitions: Responses to Seven Criticisms." Environmental Innovation and Societal Transitions 1 (1): 24–40.



Note: Initiatives included Covenant of Mayors for Climate and Energy, Compact of Mayors, C40 with adaptation action, Making Cities Resilient (UNISDR), European Green Capital Award, European Green Leaf Award, Metropolis no regret charter and Rockefeller 100 resilient cities.

Partecipazione di 650 città europee a iniziative europee e globali in materia di adattamento, dicembre 2015

Source: http://climate-adapt.eea.europa.eu/knowledge/tools/urban-adaptation



Connectivity is our growing capacity for interaction through transportation, energy and communications networks.
https://www.paragkhanna.com/home/2016/4/26/connectivity-diplomacity-and-how-cities-are-shaping-our-world
Credit: University of Wisconsin-Madison Cartography Lab

Città □ pressioni/impatti□ adattamento □ transformazione/transitione

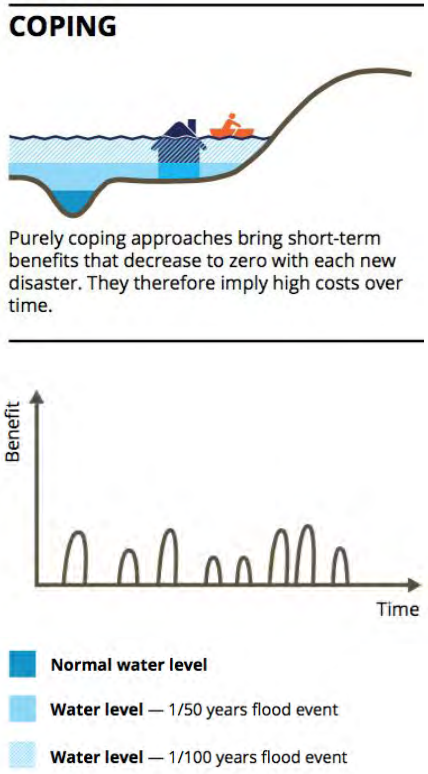
?

Approcci all’adattamento urbano e benefici complementari

COPING

cope

[kəʊp]



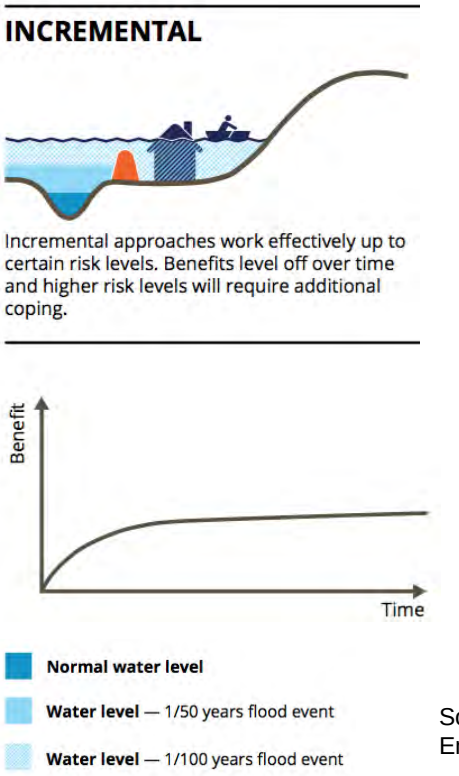
far fronte, reagire, resistere, cavarsela

è mirato a rispondere ad un evento tragico imprevisto e mettere in pratica misure di adattamento esistenti e conoscenze acquisite puntando a risolvere il problema contingente.

Source: Urban adaptation to climate change in Europe 2016 - Transforming cities in a changing climate, European Environment Agency

Approcci all’adattamento urbano e benefici complementari

INCREMENTAL ADAPTATION



incremental adaptation

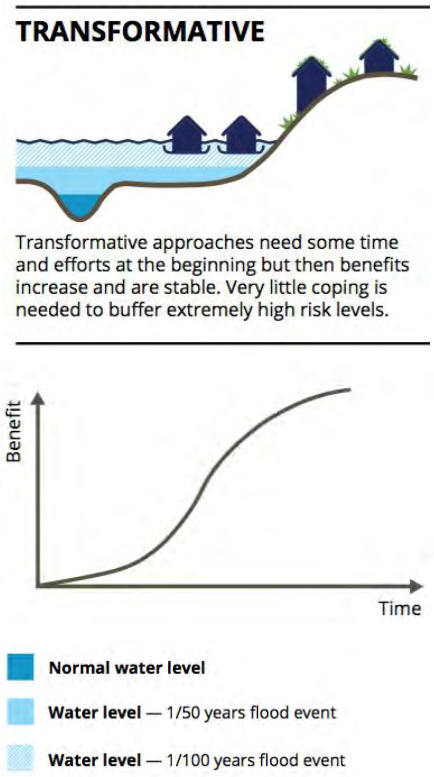
[ˌɪnkrɪˈmɛntl] [ˌædæpˈteɪʃ[/ə]n]

adattamento progressivo, incrementale

quando le misure di adattamento esistenti vengono migliorate in modo progressivo, ne viene aumentata l'efficienza e vengono attuate per seguire i requisiti evidenziati nei piani di valutazione e adattamento della vulnerabilità.

Source: Urban adaptation to climate change in Europe 2016 - Transforming cities in a changing climate, European Environment Agency

TRANSFORMATIONAL ADAPTATION



transformational adaptation

[ˌtrænsfəˈmeɪʃ[/ə]nl] [ˌædæpˈteɪʃ[/ə]n]

adattamento trasformazionale, di trasformazione

approccio più ampio e sistemico che indaga e affronta le cause (spesso legate ad azioni umane) che possono aumentare l'impatto dei cambiamenti climatici, ad es. insediamenti situati in aree a rischio, inadeguatezza dell'edilizia o altre attività umane.

Questo approccio intende combinare l'adattamento con altri aspetti dello sviluppo urbano in una prospettiva sistemica a lungo termine.

Source: Urban adaptation to climate change in Europe 2016 - Transforming cities in a changing climate, European Environment Agency

Case anfibie a Maasbommel nei Paesi Bassi

Source: www.urbangreenbluegrids.com

Case anfibie a Maasbommel nei Paesi Bassi
Source: www.urbangreenbluegrids.com

COASTAL CLIMATE RESILIENCY

Retrofitting Buildings for Flood Risk

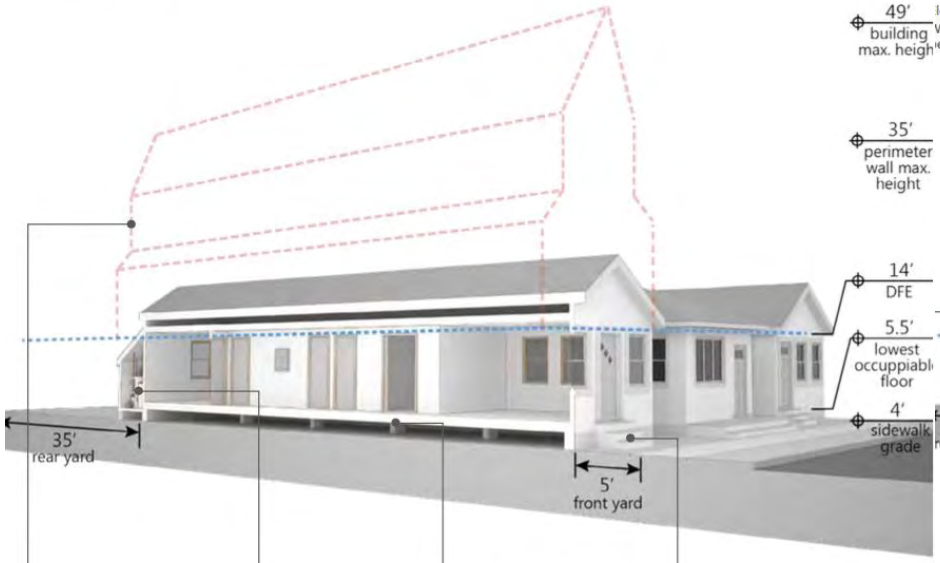
NYCPLANNING

DEPARTMENT OF CITY PLANNING CITY OF NEW YORK

EXISTING CONDITIONS

FLOOD ELEVATION

14' DFE = BFE + freeboard
= 8.5' above lowest occupiable floor
= 10' above lowest property grade



ZONING ENVELOPE

The allowable building height is measured from the DFE.

The existing building has non-compliant front and side yards, and does not provide required parking. These non-compliances must be considered when retrofitting.

The floor area is not maximized. 200 square feet can be added pursuant to underlying floor area ratio and within the adjusted bulk envelope.

CRITICAL SYSTEMS

All systems are located in a rear enclosure below the DFE.

STRUCTURAL SYSTEMS

Single story wood frame combustible construction type on shallow unreinforced masonry foundation. The wood structure is not sufficiently tied to the foundation.

ACCESS

Building access is provided at the front and rear entrances 1.5' above the sidewalk grade.

ILLUSTRATIVE RETROFIT STRATEGY

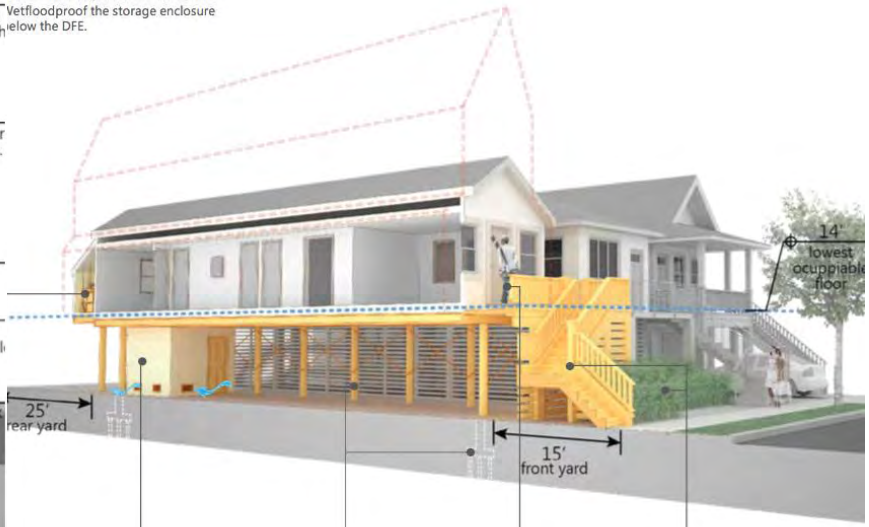
BUNGALOW

ELEVATE & WET FLOODPROOF

levate the existing structure on a ew foundation system to bring the owest occupiable floor above the FE. To accommodate access to the levated structure, shift the existing uilding footprint back from the ront property line into the rear yard.

levate critical systems above the DFE.

Vetfloodproof the storage enclosure elow the DFE.



CRITICAL SYSTEMS

Elevate systems above the DFE within a fireproofed and vented accessory structure at the rear.

USE

There is no loss of usable space because the existing home is elevated in place.

If loss of usable space occurs by relocation of access or critical systems within habitable space, that loss of usable floor area can be recaptured as an addition within the permitted bulk envelope.

The non-compliant yards remain.

The wet floodproofed area below the structure may only be used for vehicular parking, crawl space, storage or access.

STRUCTURAL SYSTEMS

Elevate the structure on columns with a spread footing foundation system. Piles may be required depending on soil conditions or by the flood hazard area designation.

Elevate the accessory structure containing the critical systems on structural columns or piles.

Insulate and fireproof underside of lowest floor to enclose building envelope.

ACCESS

The building entrance is relocated to 10' above sidewalk grade. The stairs may be located underneath or adjacent to the structure depending on available yard space and clearance underneath the structure. Here the building is shifted towards the rear property line to accommodate the stair run and porch depth.

STREETSCAPE

As per the Zoning Resolution, homes elevated over 5' above the sidewalk grade require one streetscape mitigation, and over 9' require two. These enhancements can be selected from a list of options specified in the Zoning Resolution, such as: plantings, covered and uncovered porches, stairs with 90-degree turns, or elevated front yards. Here, plantings and the stair turn are counted toward streetscape mitigations.

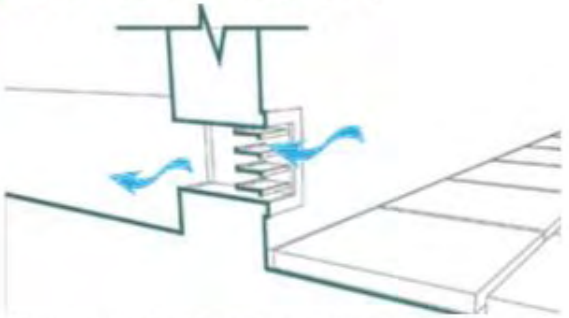
ADAPTATION CONSIDERATIONS

ACCESS

Materials within non-complying side yards must be of fire rated construction type.

When elevating buildings in residential neighborhoods, designers should consider adding elements that enhance visual connectivity to the street. Zoning requires homes to provide specific streetscape mitigations such as planting along the streetwall, open or covered porches, stair turns, or raised yards.

WET FLOODPROOFING



When wet floodproofing, openings for water penetration and exit must be engineered according to ASCE 24 requirements. A minimum of two openings is required for each enclosed area below the DFE, to be installed on at least two sides of each enclosed area. The opening should be located no higher than 1 foot above the grade immediately under each opening.

STREETSCAPE

Da un punto di vista evolutivo, John McNeil evidenzia due strategie di sviluppo dominanti.

- la *strategia dello squalo* che consiste “nell'adattamento supremo alle circostanze esistenti” e nel perseguire la *specializzazione*. Funziona bene, ma solo se le circostanze sono stabili.

- la *strategia del ratto*, considerata la migliore strategia di sopravvivenza a lungo termine in evoluzione biologica, che consiste nell'essere *adattabili*, nel ricercare diverse fonti di sussistenza e nel massimizzare la *resilienza*.

McNeill, John R. 2002, “*Qualcosa di nuovo sotto il sole: storia dell’ambiente nel XX secolo.”* Torino: Einaudi.

L’attitudine del grande squalo del 20mo secolo, assetato di risorse e capace di modificare le condizioni ambientali secondo i propri bisogni, ha determinato l’istituzione di una civiltà altamente specializzata basata sull’uso di combustibili fossili e producendo un “disordine ecologico permanente”(4) e immergendoci nell’era dell’antropocene.

(4) McNeill, John R. 2002. “*Qualcosa di nuovo sotto il sole: storia dell’ambiente nel XX secolo.”* Torino: Einaudi.

Flooded Modernity, Havsteen-Mikkelsen. Floating Art Festival, Vejle Fjord, Museo Vejle - Danimarca.

“Le condizioni sono cambiate: progettare vuol dire oggi affrontare problemi, utilizzare metodi, esprimere intenzioni differenti da un pur recente passato.” (5)

L’emergenza della questione ambientale e la consapevolezza del limite delle risorse hanno portato a riflessioni che mettono in discussione i principi e le pratiche del moderno e post-moderno, quindi “*ripensare i modi e le forme di sviluppo urbano*”. (6)

(5) Bernardo Secchi, *"Le condizioni sono cambiate”* CASABELLA, N.498/499 1984
(6) Viganò, Paola and Fabian, Lorenzo, 2010. *“The Extreme City: Climate Change and the Transformation of the Waterscape”,* Venezia: Università Iuav di Venezia - pag. 98 “On resilience”, Chiara Cavalieri

Adattamento Processo di trasformazione

Le transizioni verso la sostenibilità sono processi complessi e a lungo termine che comprendono più attori e coinvolgono necessariamente le interazioni tra tecnologia, politica/potere/politiche, economia/affari/mercati e cultura/opinione pubblica [7].

(7) Geels, Frank W. 2011. “The Multi-Level Perspective on Sustainability Transitions: Responses to Seven Criticisms.” Environmental Innovation and Societal Transitions 1 (1): 24–40.

Adattamento Processo di trasformazione

La transizione verso una città più sostenibile coinvolge aspetti tecnici e sociali della città e implica cambiamenti sistemici spesso chiamati

"*socio-technical transition*" – (*transizioni socio-tecniche)*

in quanto comportano alterazioni nella configurazione generale dei trasporti, dell'energia e dei sistemi agroalimentari, che coinvolgono tecnologia, politica, mercati, pratiche dei consumatori, infrastrutture, significati culturali e conoscenza scientifica [(4)].

(8) Geels, Frank W. 2004. “From Sectoral Systems of Innovation to Socio-Technical Systems.” Research Policy 33 (6–7): 897–920.

Nel rapporto che le città hanno con l'acqua si rendono particolarmente evidenti gli impatti negativi dei cambiamenti climatici.

La gestione dell'acqua in ambito nelle città è uno degli elementi principali nel percorso di transizione verso una maggiore sostenibilità urbana.

The extensive damage to an amusement park roller coaster in the aftermath of Hurricane Sandy, Seaside Heights, New Jersey.

Il processo di trasformazione verso l'adattamento porta alla generazione di prodotti/progetti che, nella gestione delle risorse idriche urbane, si concretizzano perlopiù in infrastrutture volte ad attutire o a rispondere agli impatti.

Stepwell “Chand Baori”, Abhaneri, Rajasthan, India. VII secolo

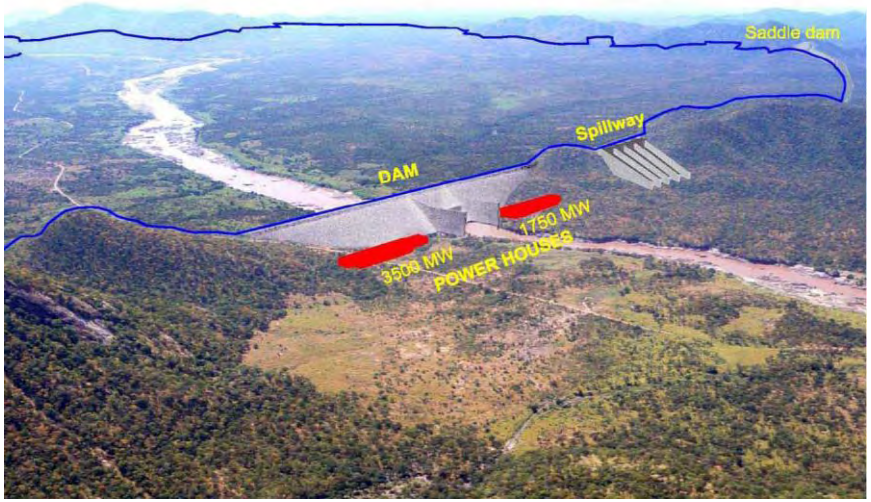
Infrastruttura

[in·fra·strut·tù·ra]

struttura o complesso di elementi che costituiscono la base di sostegno o comunque la parte sottostante di altre strutture; anche in senso fig.: le i. di una società; usato per lo più al plurale, per indicare le opere complementari necessarie allo svolgimento di un'attività economica (strade, ferrovie, aeroporti, ecc.) o indispensabili per nuovi insediamenti urbani (fognature, parchi, giardini, ecc.).

Grey infrastructure –Infrastrutture grigie *funzione e prestazione*

La filosofia più tecno-centrica dell'approccio convenzionale tipico della storia recente, che prevede l'utilizzo di soluzioni tecniche, ha spesso affrontato la gestione idrica urbana (e non) attraverso sistemi tradizionali o grey infrastructure con numerose conseguenze ambientali ed economiche.



Diga sul Nilo " Grand Renaissance Dam", Ethiopia in fase di completamento

Infrastructure

“L'infrastruttura, come la conosciamo, non appartiene più al regno esclusivo degli ingegneri e dei pianificatori dei trasporti. Nel contesto delle nostre città in rapida evoluzione, le infrastrutture stanno vivendo un cambiamento di paradigma in cui la programmazione per usi multipli e l'integrazione di ecologie latenti è una considerazione primaria. Definire un'infrastruttura contemporanea richiede un team multidisciplinare di paesaggisti, ingegneri, architetti e pianificatori per realizzare pienamente i benefici per i nostri sistemi culturali e naturali.”(9)

(9) Hung, Ying-Yu, and SWA Group, eds. 2011. Landscape Infrastructure: Case Studies by SWA. Basel: Birkhäuser.

Un approccio alternativo, più olistico e eco-centrico, propone una maggiore armonizzazione tra la progettazione, il funzionamento e la funzione delle infrastrutture artificiali e la progettazione spaziale nelle aree urbane.

Nel caso degli estremi climatici legati all'acqua sempre più spesso si assiste all'utilizzo della natura come infrastruttura che comporta l'uso di blue/green infrastructures. La natura è quindi utilizzata per rispondere a una prestazione.

Blue/green infrastructures - multiple benefits

PROVISIONING SERVICES

flexible infrastructure/
climate change adaptation

water resource

flows to treatment/
filtration areas

groundwater recharge

tourism

crime

REGULATING SERVICES

air quality

carbon

flood risk

water quality of
receiving water

air/building temperature

groundwater recharge

water resource

CULTURAL SERVICES

amenity/
quality of space

recreation

flood risk

water quality of
receiving water

water resource

crime

education

noise

PR/CSR

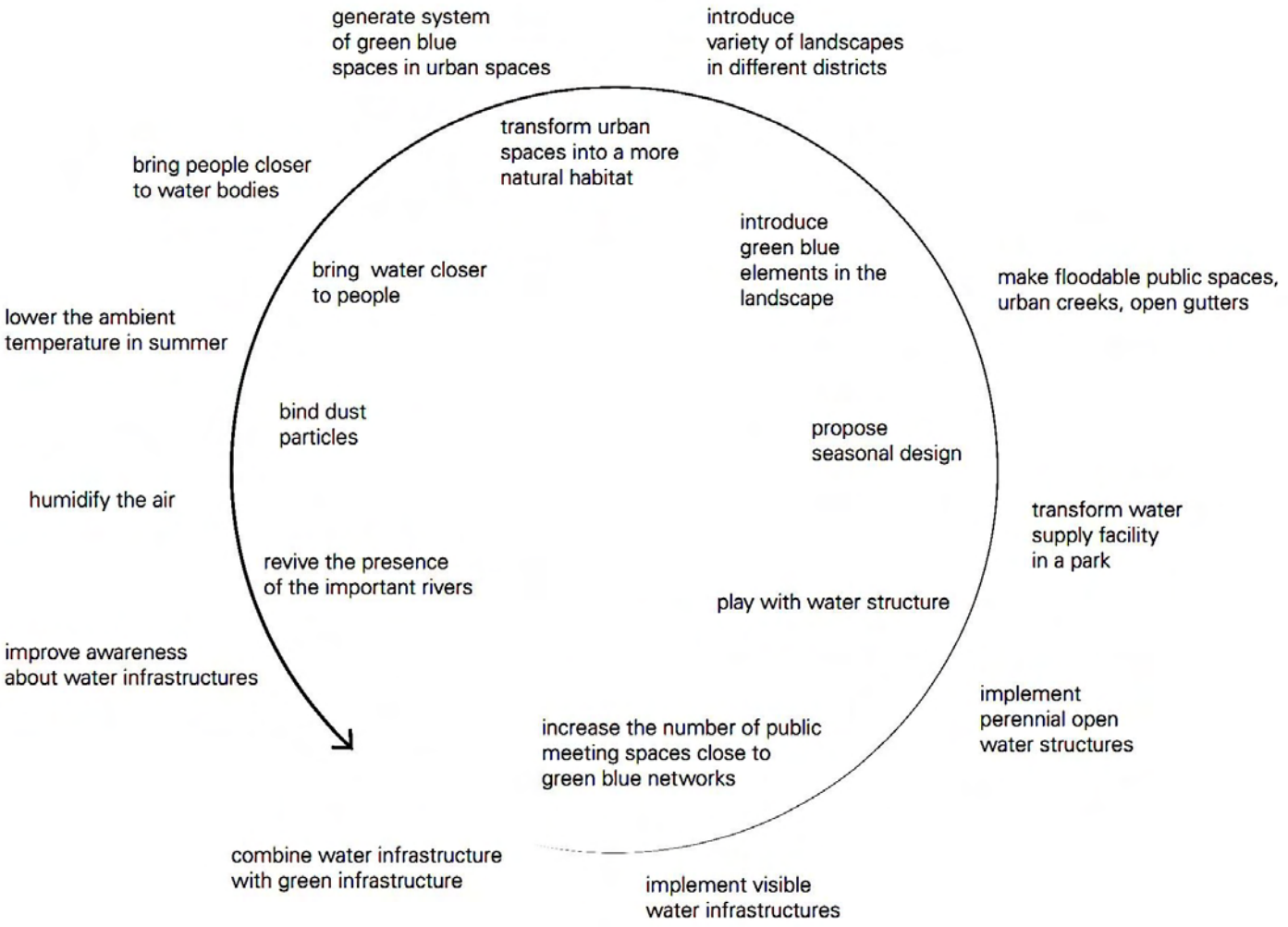
traffic calming

SUPPORTING SERVICES

biodiversity (habitats)

Source: Bacchin, T.K.; van Timmeren, A. Aires, C. (2015) JPI Urban Europe GREEN/BLUE CITIES, TU Delft

Blue/green infrastructures - multiple benefits



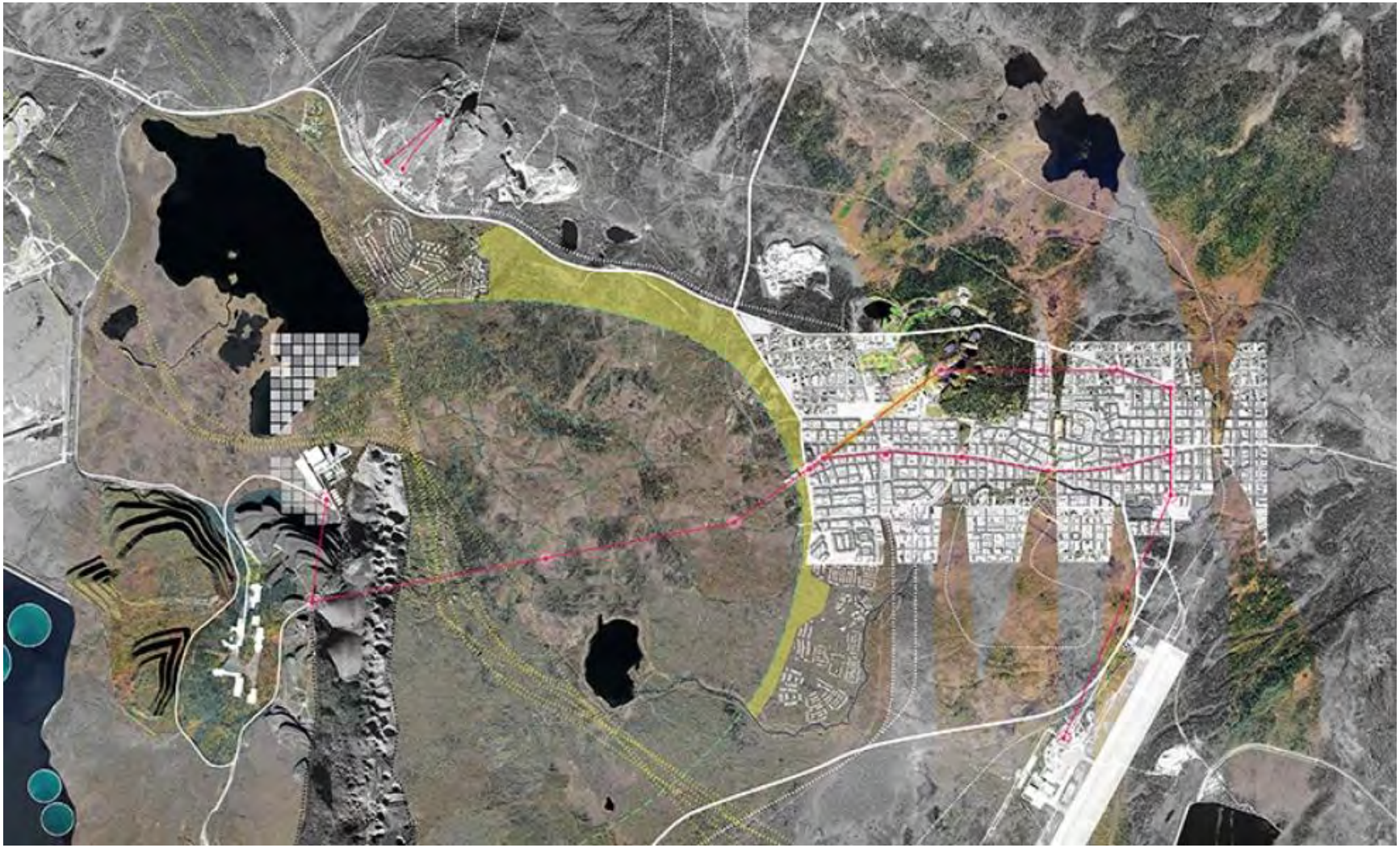
Source: Bacchin, T.K.; van Timmeren, A. Aires, C. (2015) JPI Urban Europe GREEN/BLUE CITIES, TU Delft

Dal punto di vista della gestione idrica, Vladimir Novotny identifica 4 modelli o paradigmi storicamente riconoscibili esistenti che riflettono l'evoluzione della relazione tra la città e le sue risorse idriche(10).

Novotny sostiene che un nuovo modello o quinto paradigma di gestione delle risorse idriche sostenibile e resiliente che adotta un approccio olistico piuttosto che un funzionalista emerge ed è sempre più accettato e supportato.

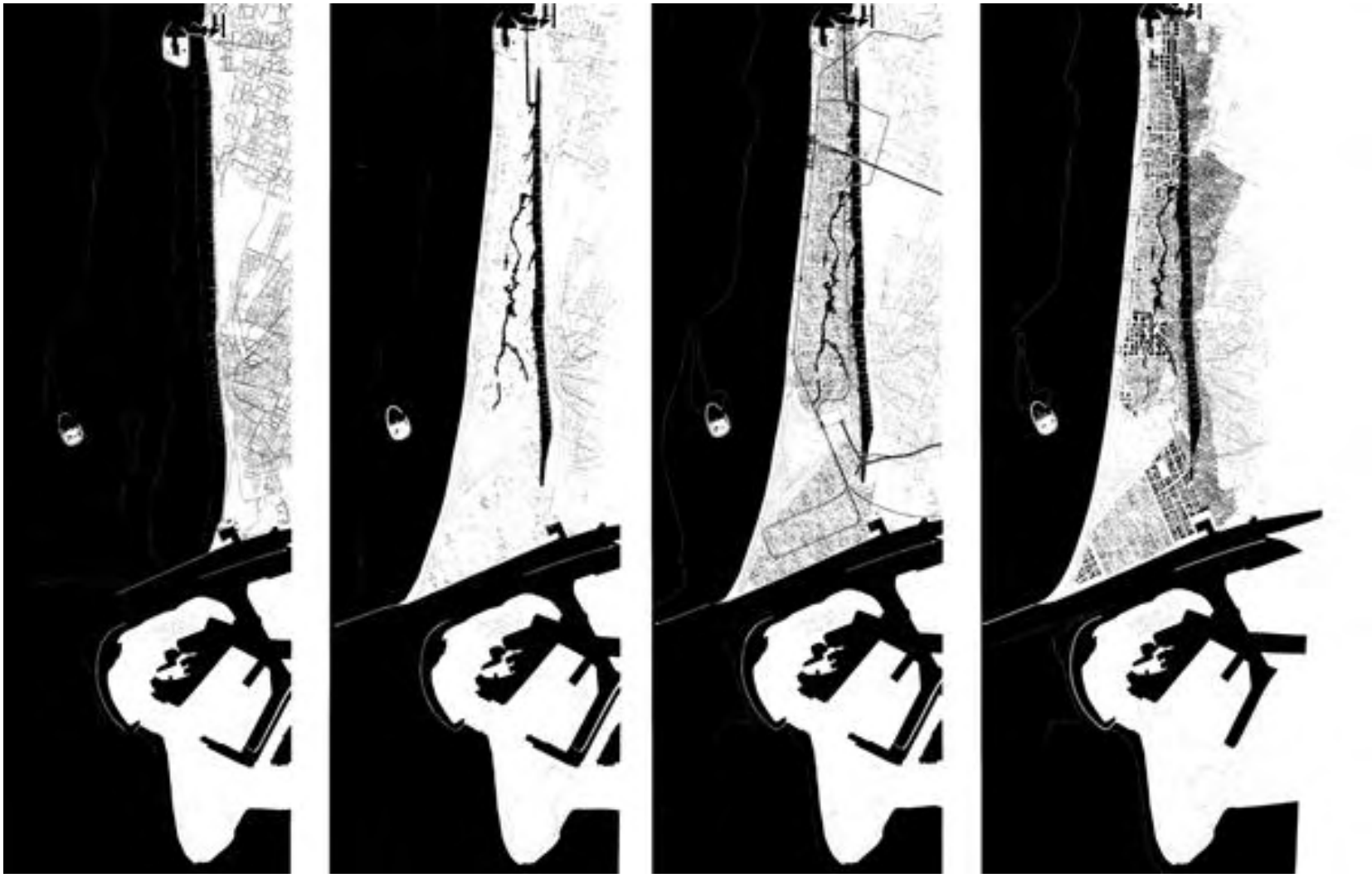
Questo nuovo approccio nella gestione delle risorse idriche può essere più generalmente riferito a un nuovo approccio nella produzione di spazi urbani e a una nuova relazione tra le città e la natura all'interno dei propri confini.

(10) Vladimir Novotny, "Cities for the Future - Towards integrated sustainable water and landscape management".



NEW KIRUNA, SE - White Arkitekter AB and Ghilardi + Hellsten Arkitekter.

NEW KIRUNA, SE - White Arkitekter AB and Ghilardi + Hellsten Arkitekter.



Buckthorn City, Hoek Van Holland, The Netherlands – Adriaan Geuze und Matthew Skjonsberg

Chulalongkorn Centenary Park, Bankok - Landprocess - architect Kotchakorn Voraakhom. During flooding underground containers retain water, which is released into the sewage system once flooding has subsided.

Siegen, Germania 1968

Siegen, Germania – progetto Studio LOIDL + BPR – dal 2012 al 2016

Siegen, Germania – progetto Studio LOIDL + BPR – dal 2012 al 2016

Adattamento Processo di trasformazione

Mentre intraprendono il percorso verso obiettivi di adattamento e successive fasi di sostenibilità nel contesto degli impatti climatici legati all'acqua, il rapporto tra città e natura all'interno dei propri confini viene forzatamente modificato.

Un interesse della mia ricerca è scoprire come questo rapporto viene cambiato e, di conseguenza, come lo spazio urbano viene modificato dai processi di adattamento e dai progetti generati, che utilizzano la natura come infrastruttura e/o la tradizionale infrastruttura grigia.

C'è bisogno di una procedura diagnostica affidabile che possa aiutare i pianificatori, gli analisti politici, i decisori nella selezione e nella progettazione di iniziative di azione strategica che meglio si adattino alle condizioni attuali di un sistema idrico urbano per consentire i cambiamenti desiderati del sistema (12).

Molte città mancano delle competenze e capacità organizzative necessarie per coniugare resistenza e resilienza agli impatti climatici con ulteriori obiettivi di sostenibilità (13).

(12) Ferguson, Briony C., Rebekah R. Brown, and Ana Deletic. 2013. “Diagnosing Transformative Change in Urban Water Systems: Theories and Frameworks.” Global Environmental Change 23 (1): 264–80.
(13) Liu, Li, and Marina Bergen Jensen. 2017. “Climate Resilience Strategies of Beijing and Copenhagen and Their Links to Sustainability.” Water Policy 19 (6): 997–1013.

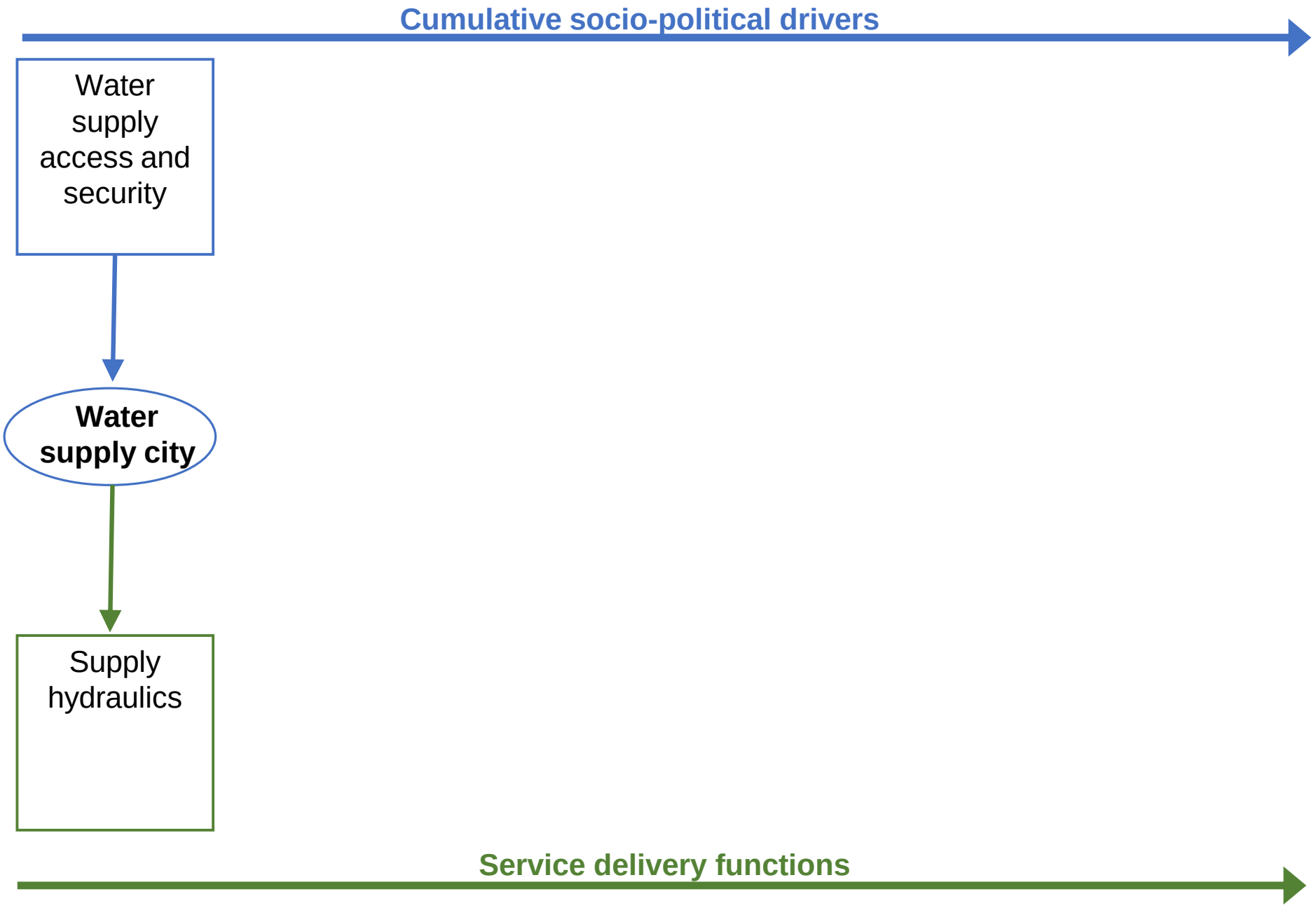
Urban water management transitions framework

Il percorso verso la sostenibilità urbana nella gestione idrica è stato descritto da una struttura che indica il grado di transizione e avanzamento delle città nel *Urban water management transitions framework* .[14, 15]

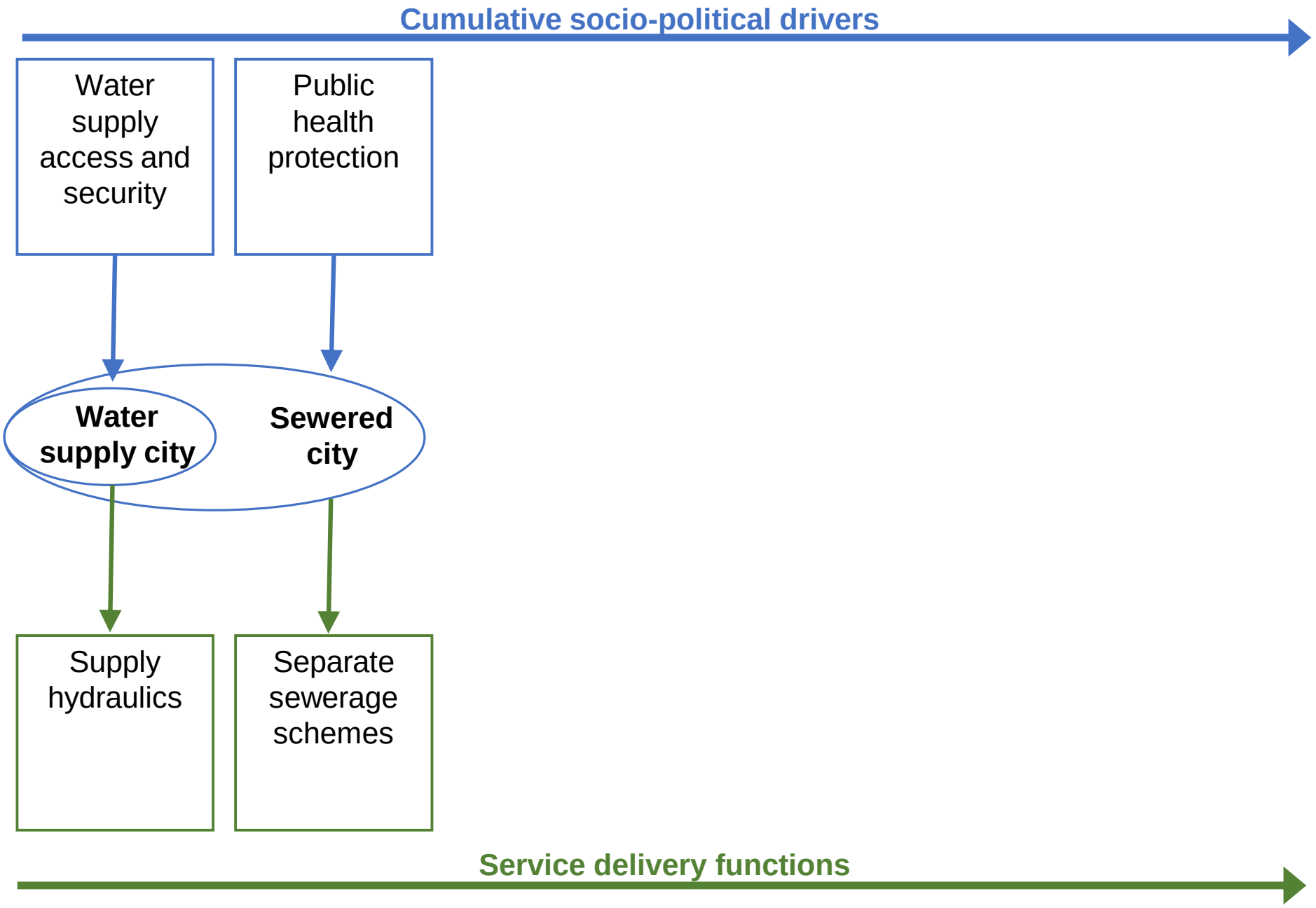
Il *transitions framework* si propone come strumento concettuale per analizzare lo sviluppo della politica di transizione idrica urbana e l'analisi *benchmarking* su scala urbana.

(14) Brown, R. R., N. Keath, and T. H. F. Wong. 2009. “Urban Water Management in Cities: Historical, Current and Future Regimes.” Water Science & Technology 59 (5): 847.
(15) Wong, T. H. F., and R. R. Brown. 2009. “The Water Sensitive City: Principles for Practice.” Water Science & Technology 60 (3): 673.

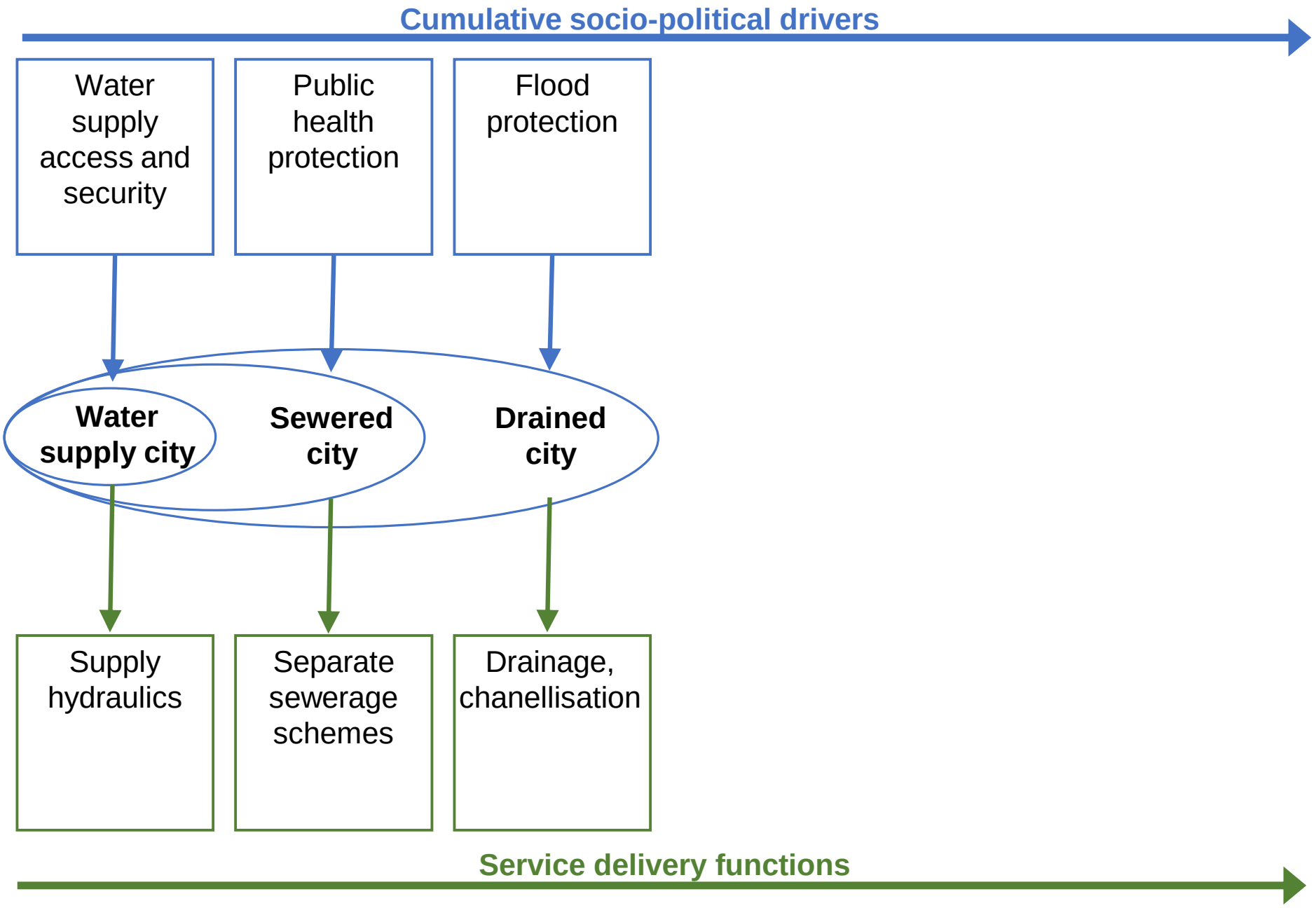
Urban water management transition framework



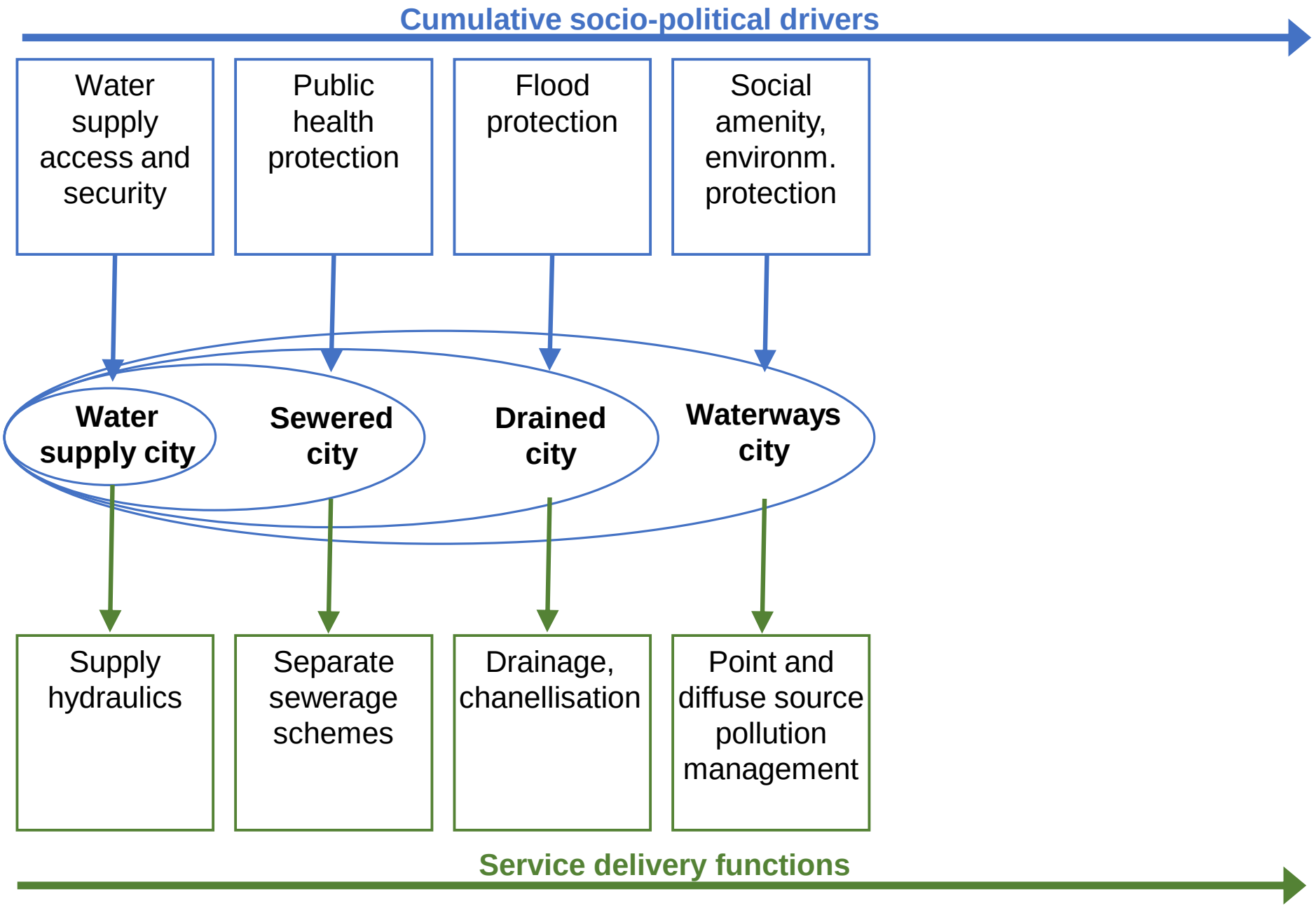
Urban water management transition framework



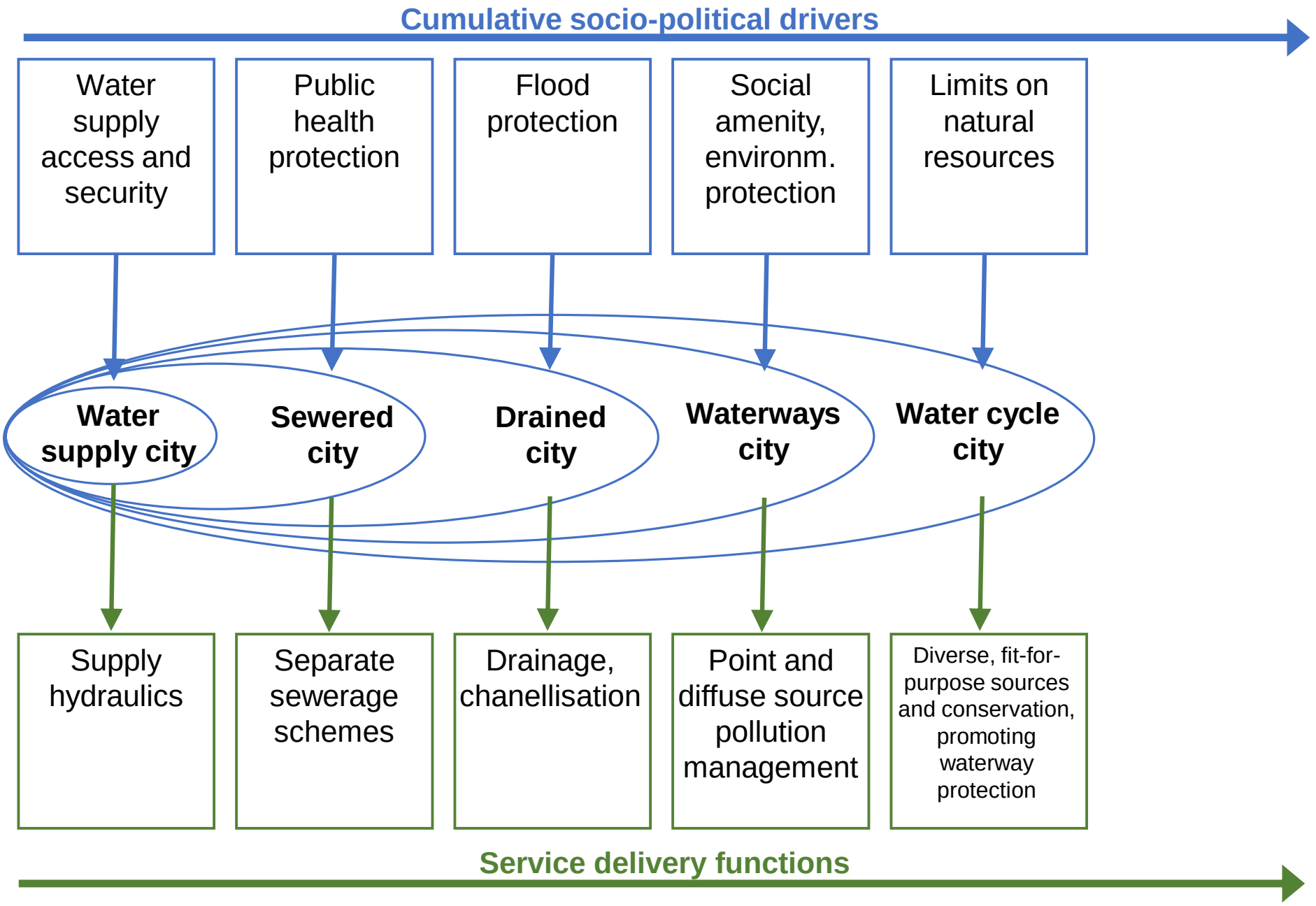
Urban water management transition framework



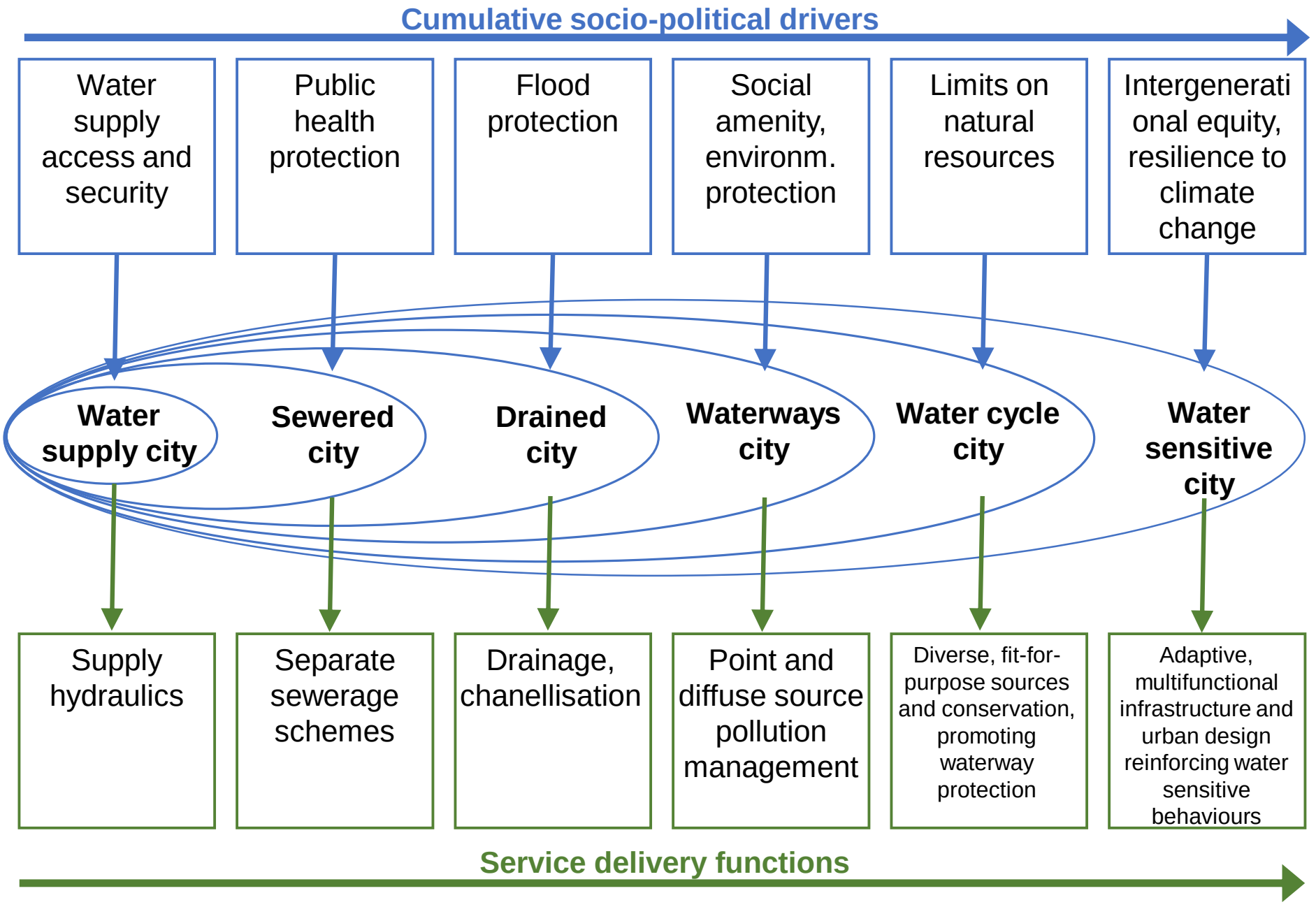
Urban water management transition framework



Urban water management transition framework



Urban water management transition framework



Urban water management transitions framework

Tiene conto dei contesti temporali, ideologici e tecnologici che le città attraversano nel percorso verso la gestione sostenibile dell'acqua in ambito urbano e appare come un valido strumento per confrontare i risultati delle analisi operate su casi studio differenti anche per ambito climatico, organizzazione e struttura gestionale, politica, decisionale, dimensione e percorso [13, 14] .

(13) Brown, R. R., N. Keath, and T. H. F. Wong. 2009. "Urban Water Management in Cities: Historical, Current and Future Regimes." Water Science & Technology 59 (5): 847.
(14) Wong, T. H. F., and R. R. Brown. 2009. "The Water Sensitive City: Principles for Practice." Water Science & Technology 60 (3): 673.

Meso/micro level - project scale - adaptation projects

Infrastructure projects

GREY INFRASTRUCTURE (GI)

-

Shark

-

function and performance

techno-centric philosophy of the conventional approach

BLUE-GREEN INFRASTRUCTURE (BGI)

-

Rat

-

Nature as infrastructure multiple benefits

holistic and eco-centric approach, harmonization between functioning, function, performance and spatial planning in urban areas

MIXT INFRASTRUCTURE (MI)

-

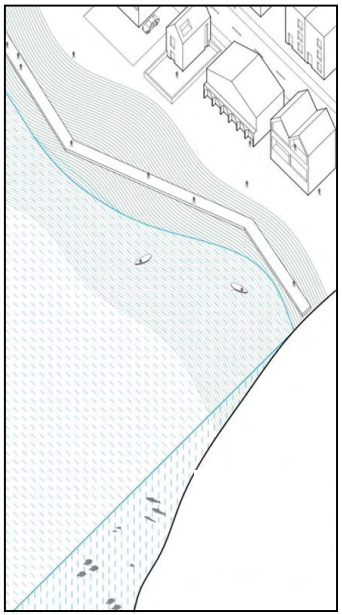
Projects using both blue-green and grey infrastructure

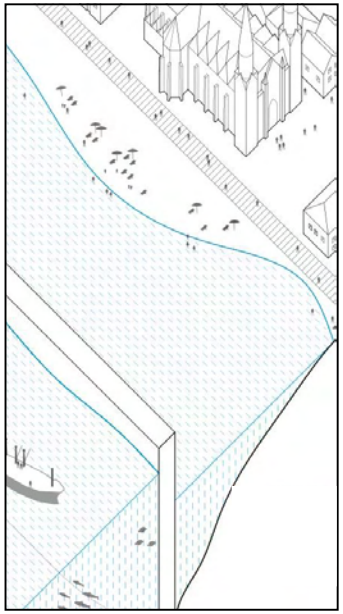
integration among the techno-centric and the holistic and eco-centric approach

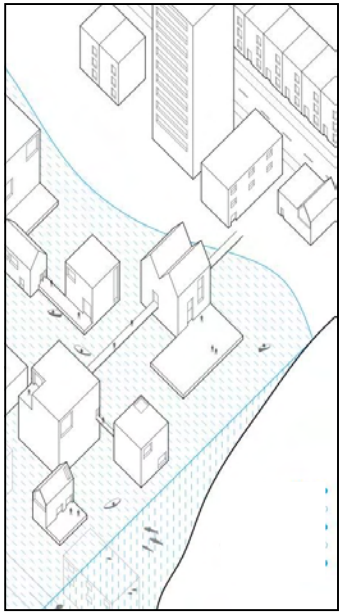
Meso/micro level - project scale - adaptation projects

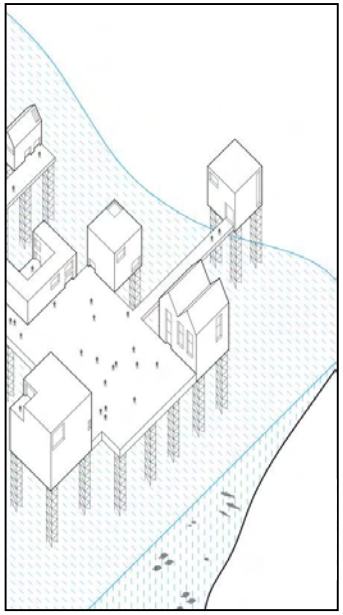
Spatial relation with water – action towards water

IN	OUT	ON	ABOVE
Absorb/contain	Reject/repel	Float	Suspend





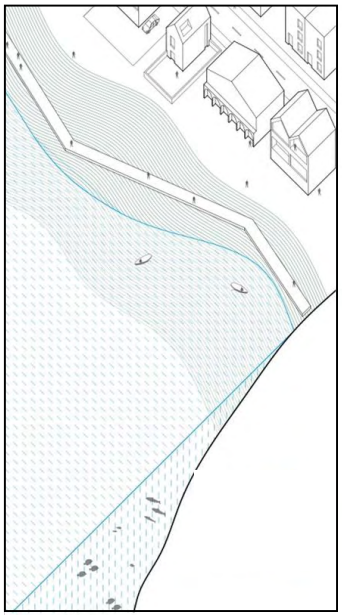


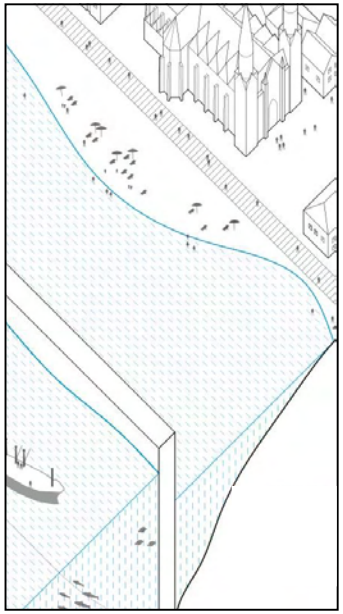


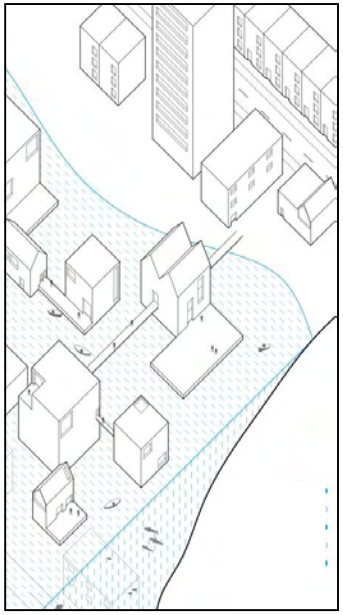
Meso/micro level - project scale - adaptation projects

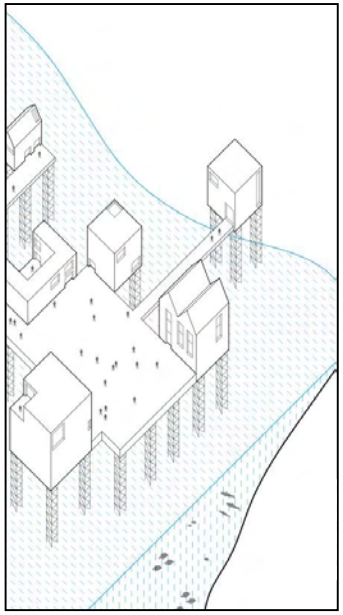
Spatial relation with water – action towards water

IN Absorb/contain	OUT Reject/repel	ON Float	ABOVE Suspend
- Retrofit/ reuse - Add - Remove	- Retrofit/ reuse - Add - Remove	- Retrofit/ reuse - Add - Remove	- Retrofit/ reuse - Add - Remove



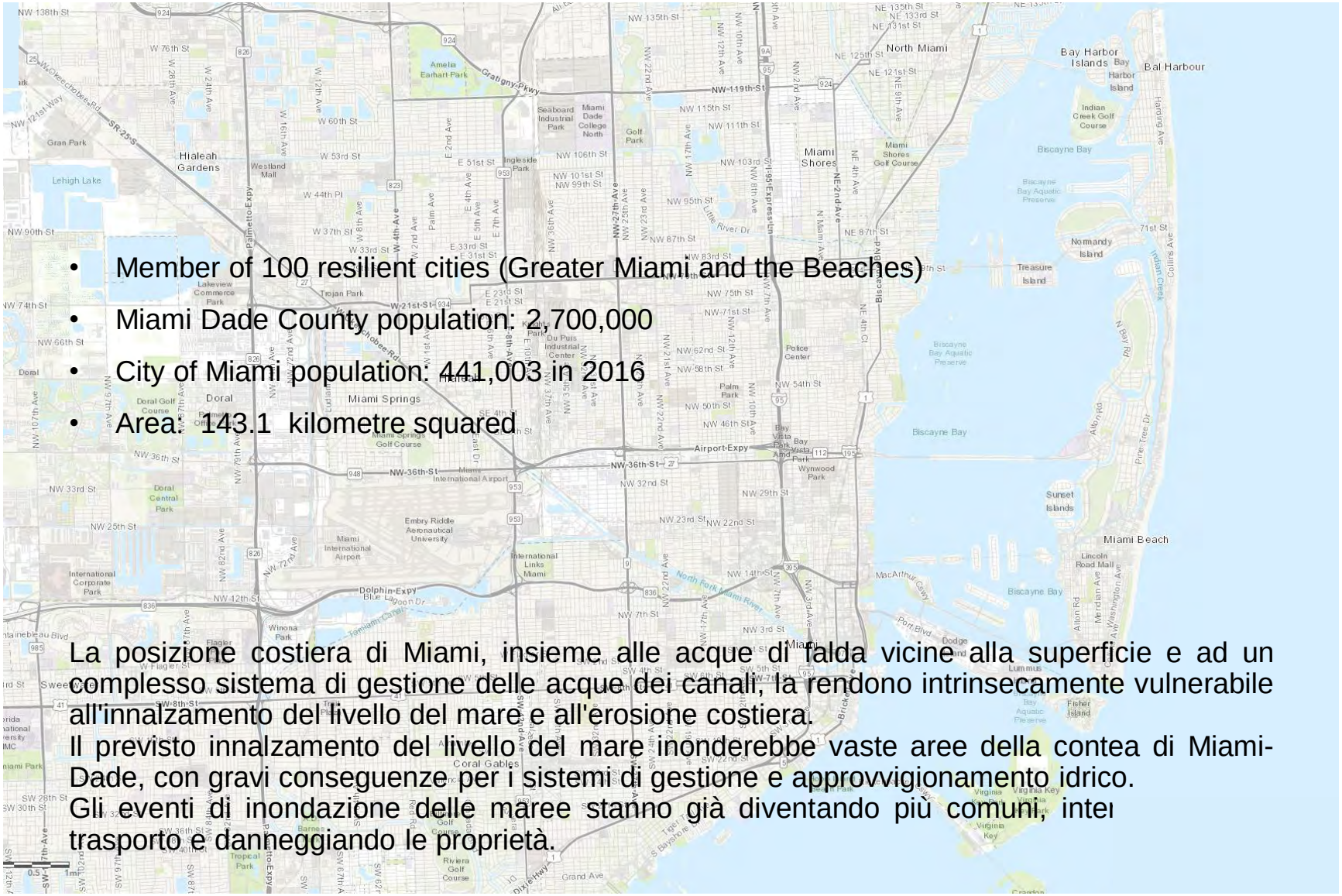






Miami

Miami



- Member of 100 resilient cities (Greater Miami and the Beaches)
- Miami Dade County population: 2,700,000
- City of Miami population: 441,003 in 2016
- Area: 143.1 kilometre squared

La posizione costiera di Miami, insieme alle acque di falda vicine alla superficie e ad un complesso sistema di gestione delle acque dei canali, la rendono intrinsecamente vulnerabile all'innalzamento del livello del mare e all'erosione costiera.
Il previsto innalzamento del livello del mare inonderebbe vaste aree della contea di Miami-Dade, con gravi conseguenze per i sistemi di gestione e approvvigionamento idrico.
Gli eventi di inondazione delle maree stanno già diventando più comuni, inter trasporto e danneggiando le proprietà.

Miami

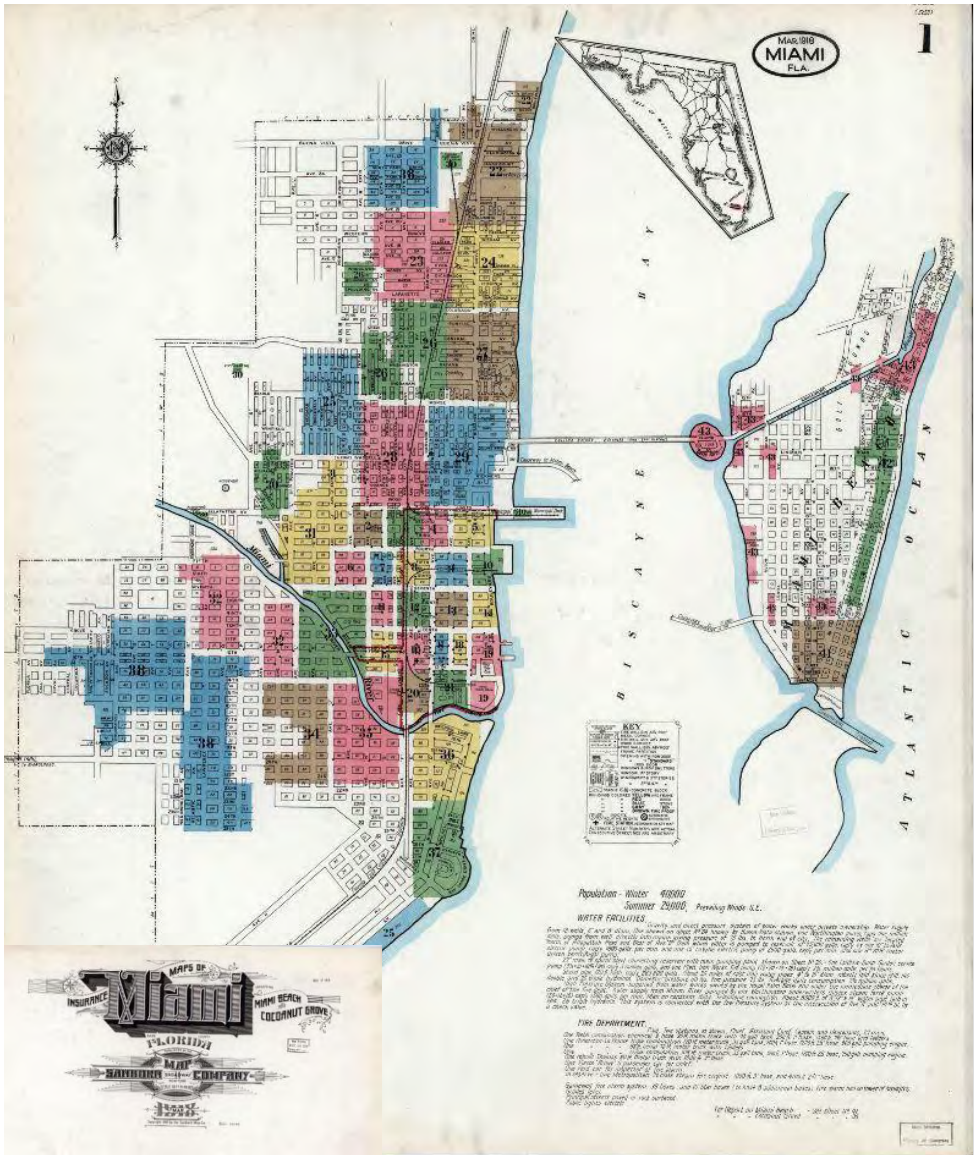
View of men clearing man on Lincoln Road, early 1900s
Source: http://dpanther.fiu.edu/dpanther/items/itemdetail?bibid=MB17120442&vid=00030#dvFilePanel

Miami

Copy of aerial view of Miami Beach looking south Miami Beach early photographs – 1900-1920
Source: http://dpanther.fiu.edu/dpService/dpPurlService/purl/MB17120442/00003

.

Miami



Map of Miami and Miami Beach in 1918 - Insurance Maps of Miami, Florida
Publisher: Sanborn Map Co. - Base Map Date: March 1918

Miami

Miami

Miami

Octopus in a parking lot during a king tide

Miami

Miami during a king tide

Miami

Miami during a king tide

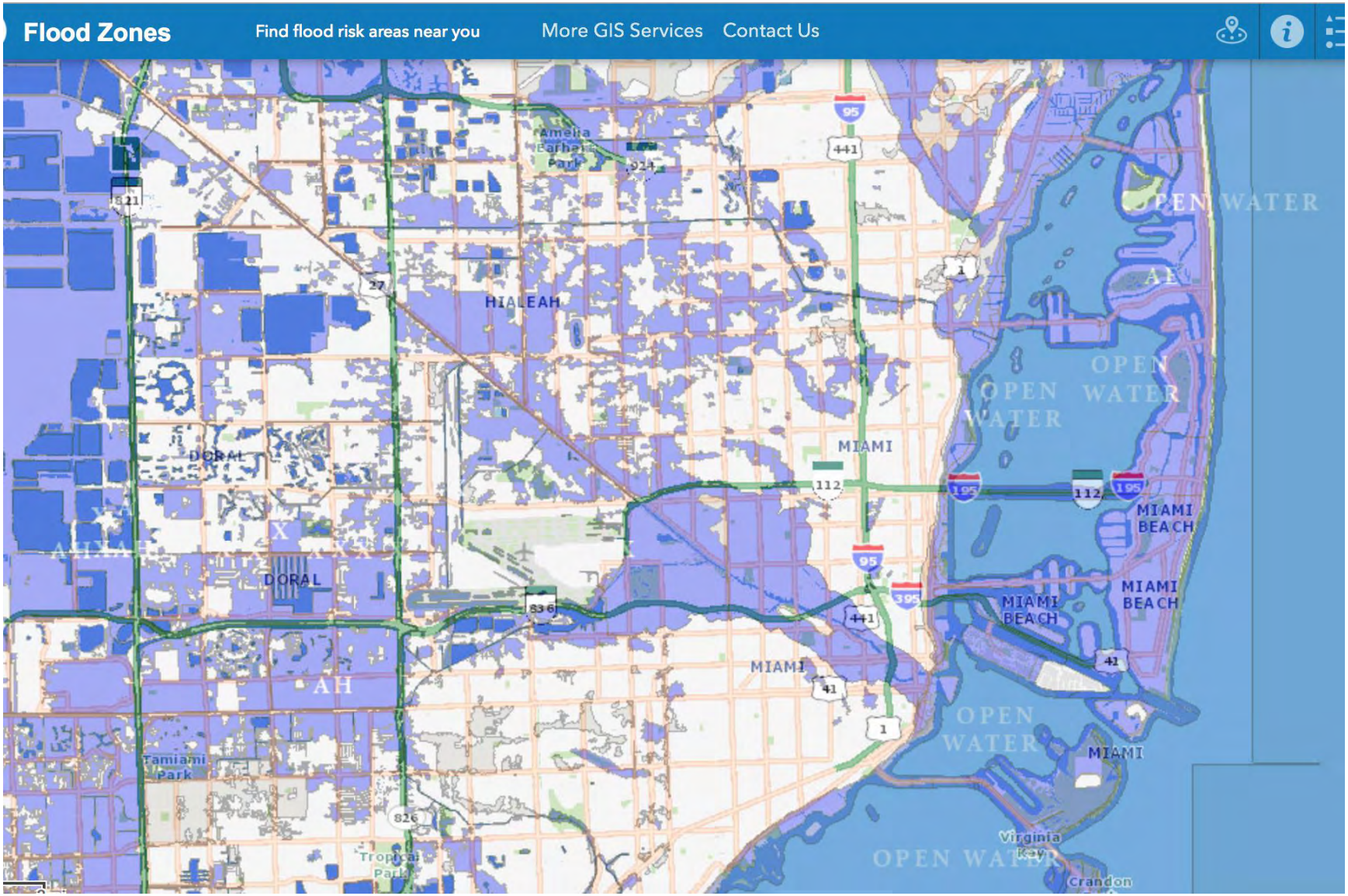
Miami

The Wolfsonian FIU – Originally built in 1927 by Robertson & Patterson to house the Washington Storage Company.

Miami

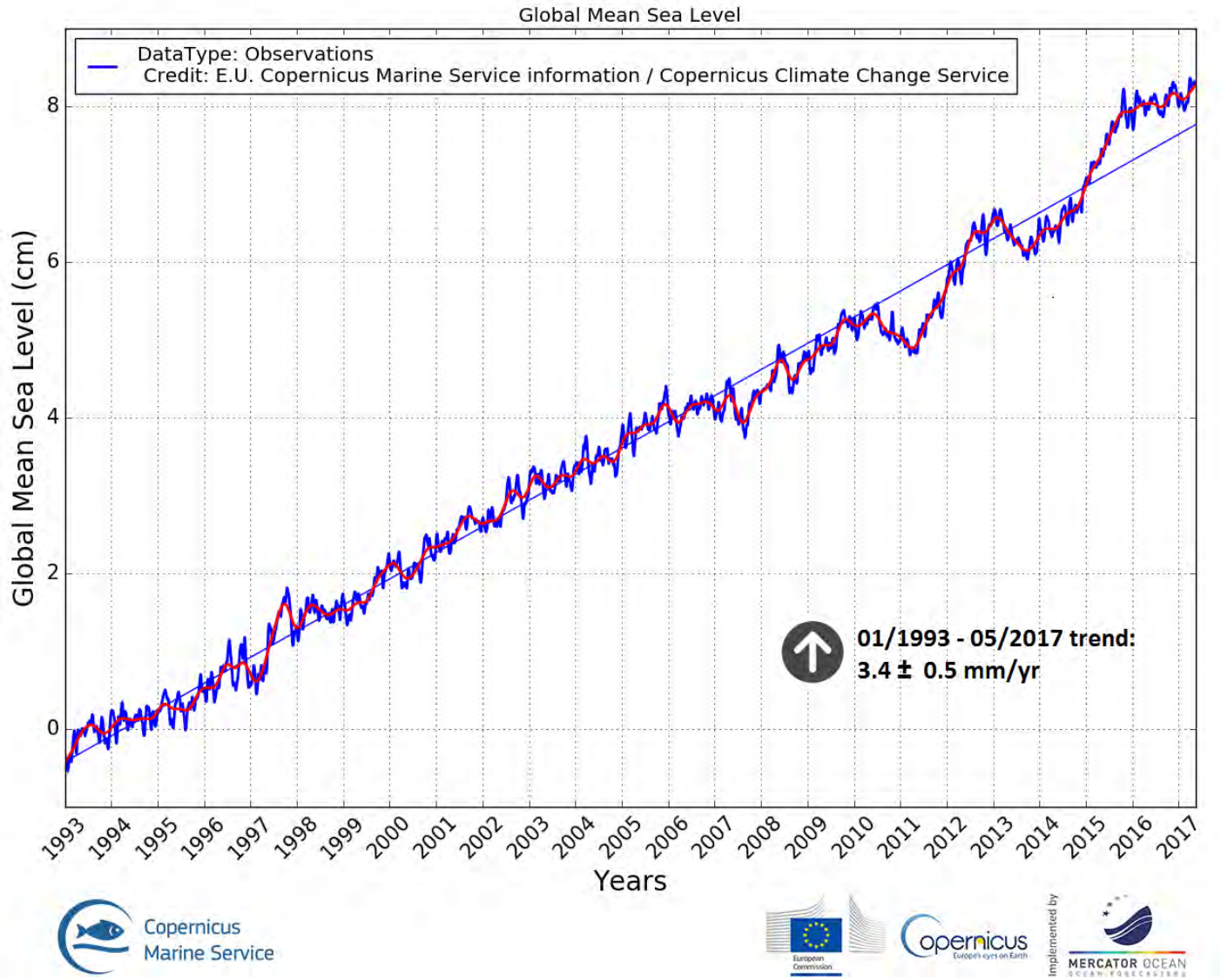
Vizcaya Museum and Gardens. The Barge, boat-shaped stone structure in Biscayne Bay, was built as a breakwater to protect the house and terraces from waves. - Source: https://www.wlrn.org

Miami - Adaptation process



Flooded Zones, Miami Dade County

Miami - Adaptation process



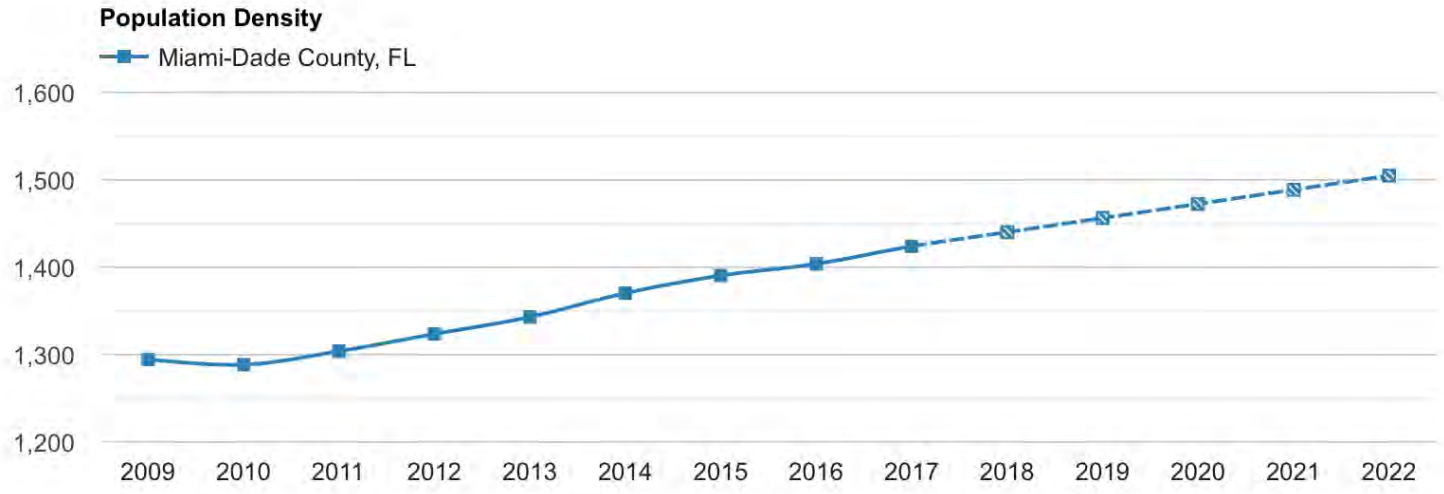
Source: http://marine.copernicus.eu/science-learning/ocean-monitoring-indicators/catalogue/

Si stima che nel 2050 circa 550 milioni di persone vivranno nelle città costiere.(17)

Circa 100 milioni di persone vivono a un'altitudine compresa tra 0 e 180 cm dal livello medio del mare. (18)

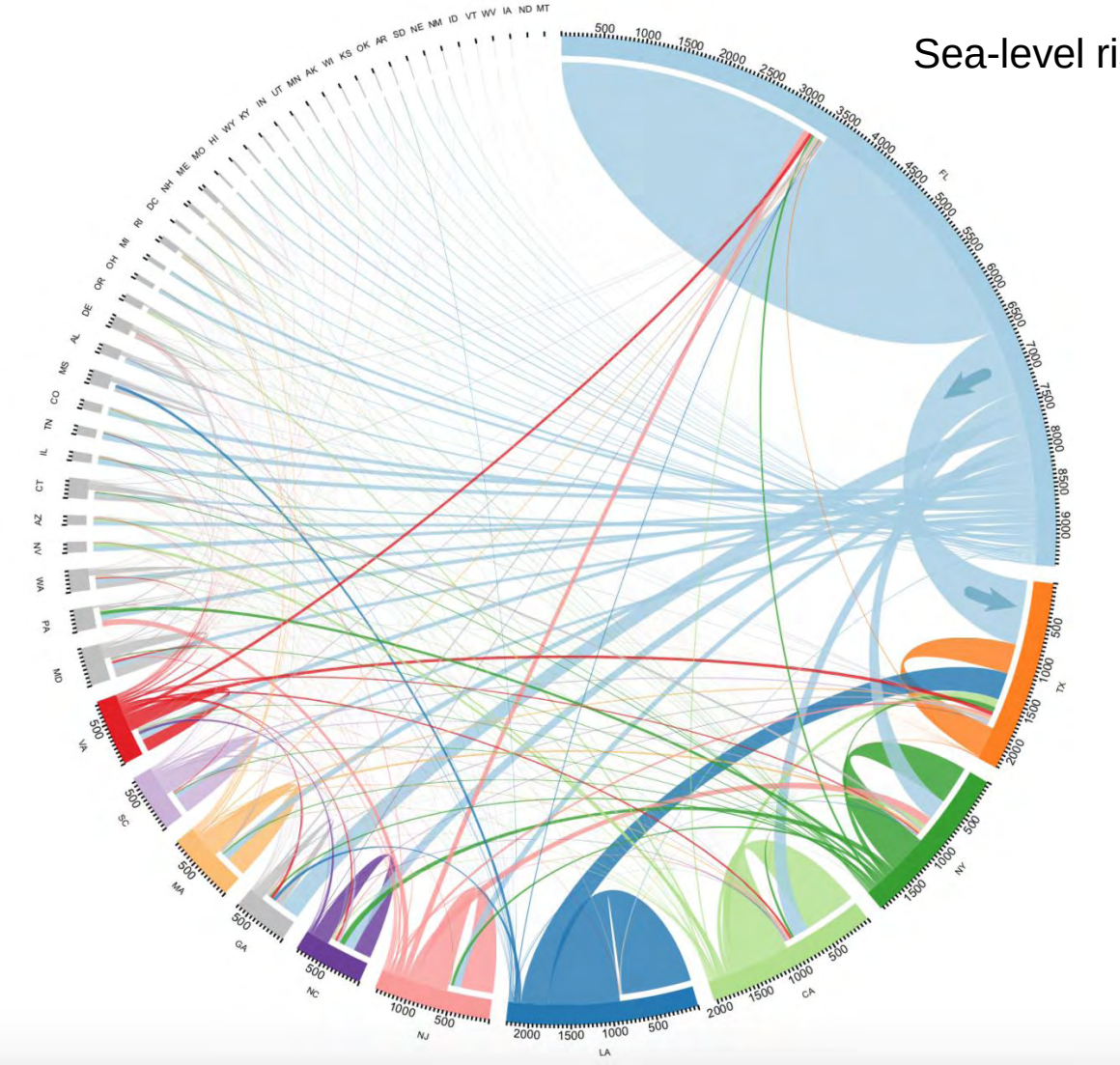
(17) UN-Habitat. 2016. Urbanization and Development: Emerging Futures. World Cities Report 2016. Nairobi, Kenya: UN-Habitat.
(18) NOAA - National Oceanic and Atmospheric Administration. 2017. “Global and Regional Sea Level Rise Scenarios for the United States.”

Population Density API



Densità della popolazione di Miami Dade County rilevata e prevista nei prossimi anni.

Sea-level rise migration in the US



Circular plot of bi-lateral sea level rise migration flows for US States under the 1.8m scenario and no adaptation. Tick marks show the number of migrants (inflows and outflows) in thousands. States are ordered clockwise by the size of inflows.

Source: Migration induced by sea-level rise could reshape the US population landscape by Mathew E. Hauer published by Nature 4/17/2017

Miami - Adaptation process

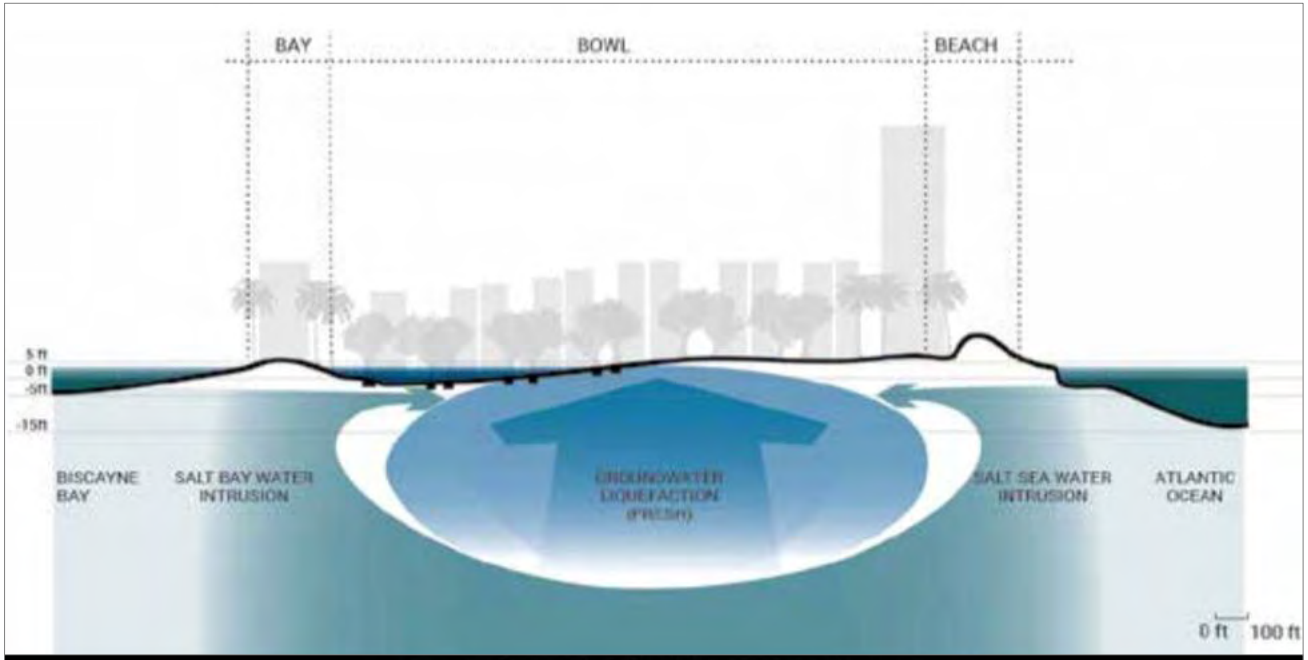
Dealing with the flood – quattro approcci locali

- Rifiuto – negazione del problema
- The Science Fix – la scienza risolverà
- Mondo acquatico
- Esodo(19)

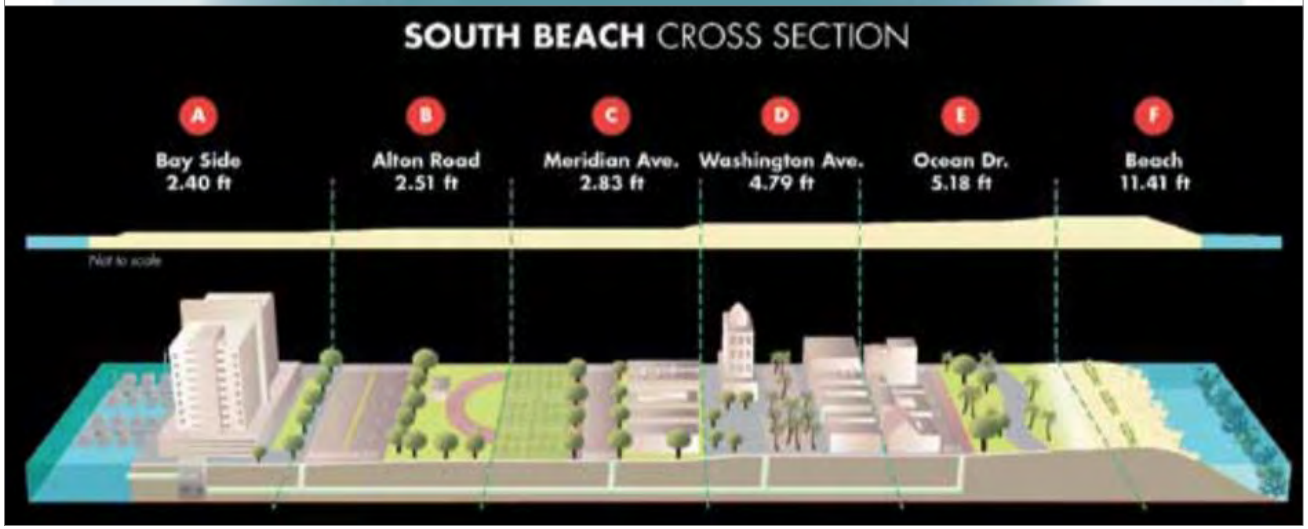
(19) Portes, A., Armony A.C., The Global Edge. Miami in the twenty-first Century, 2018, University of California Press.

Miami

A.

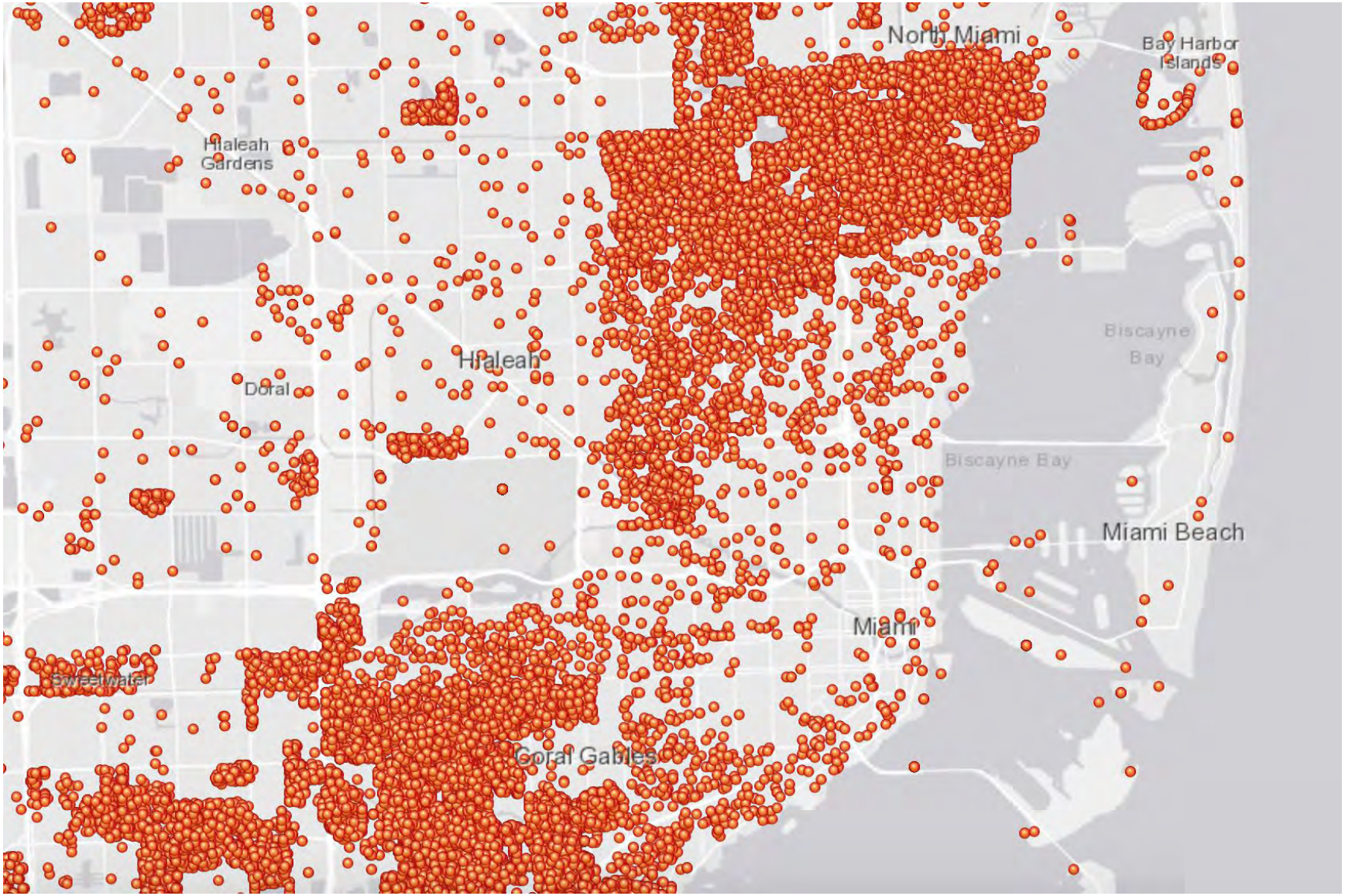


B.



A. Un'illustrazione della tipologia spiaggia / bacino / baia che si traduce in una "ciotola" d'acqua dolce al centro dell'isola.
B. Oltre il 20% delle proprietà di Miami Beach giace al di sotto di 3,7 piedi NAVD, e il 93% si trova all'interno dell'area di pericolosità speciale *Special Flood Hazard Area* indicata dalla FEMA.
Source: ULI / Local Office Landscape & Urban Design

Miami - Adaptation process



Septic tanks in Miami Dade County

Miami - Adaptation process

<u>Open source documents and data</u>

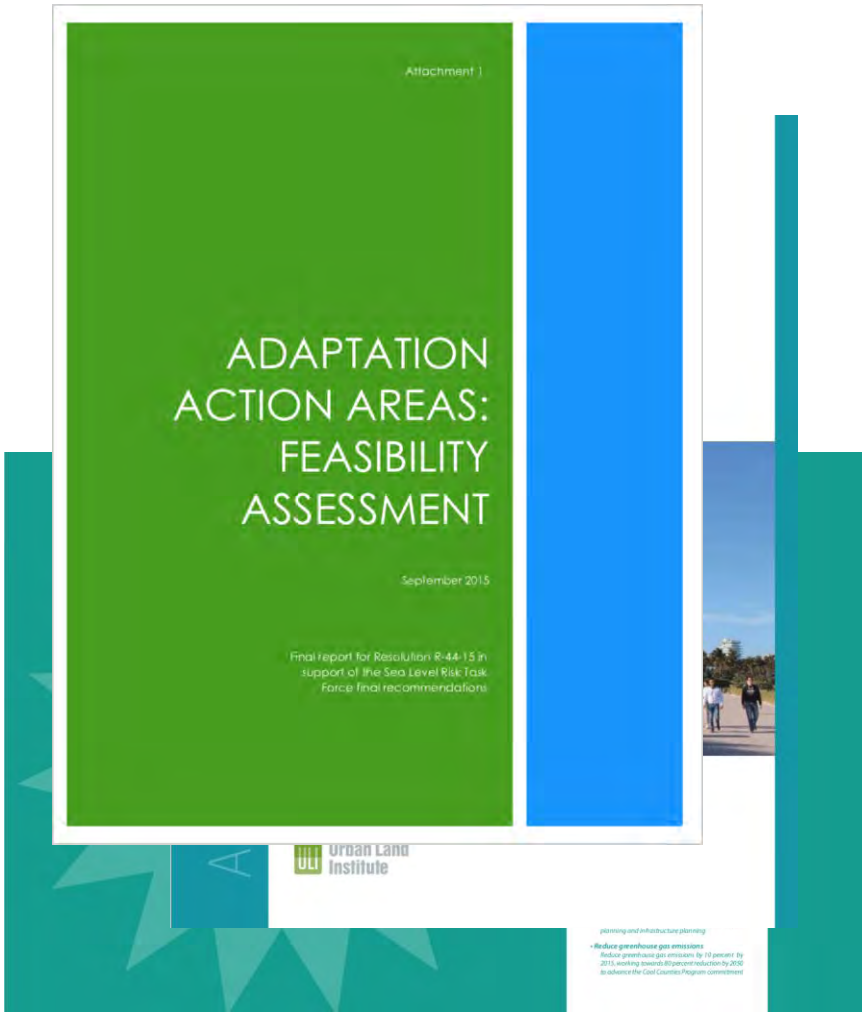
- *Adaptation plans and strategies*
- *Water management plans*
- *Reports*
- *Risk assessment and vulnerability*
- *Database*
- *Research articles and publications*
- *Implemented actions*
- *…*

Miami - Adaptation process

<u>*Open source documents and data*</u>

- *Adaptation plans and strategies*
- *Water management plans*
- *Reports*
- *Risk assessment and vulnerability*
- *Database*
- *Research articles and publications*
- *Implemented actions*
- *…*

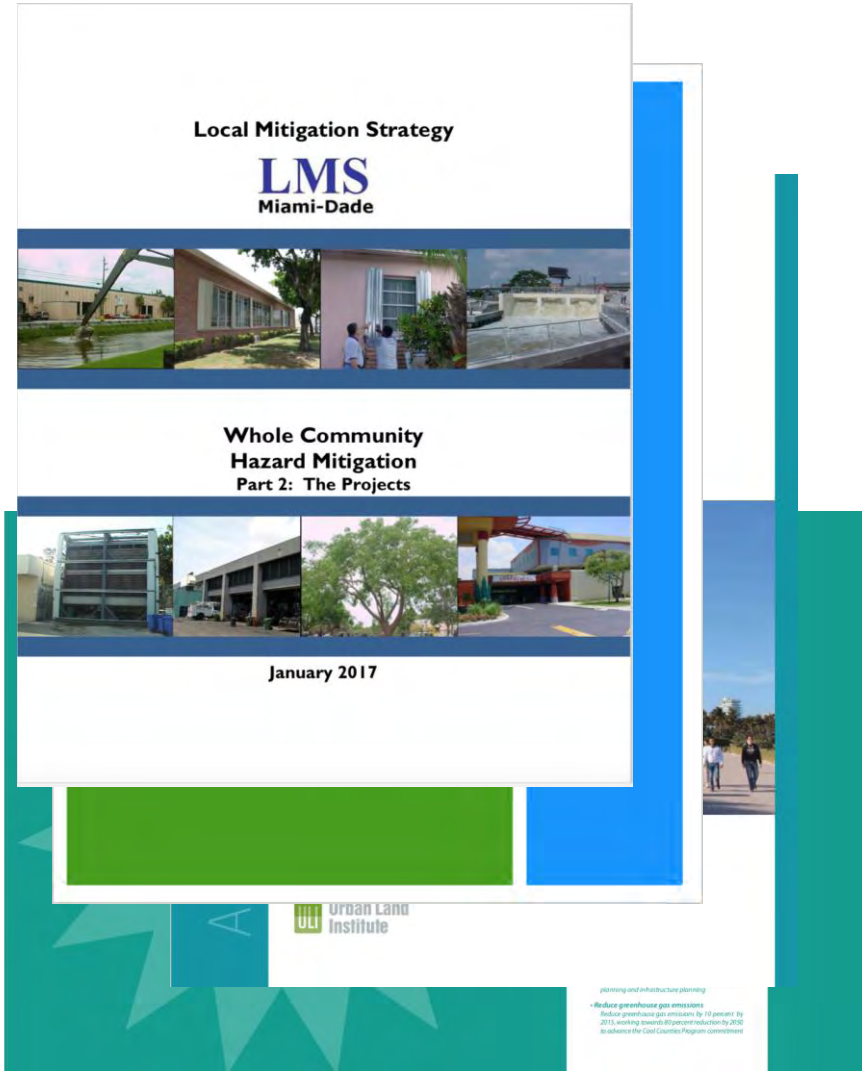
Miami - Adaptation process



<u>Open source documents and data</u>

- *Adaptation plans and strategies*
- *Water management plans*
- *Reports*
- *Risk assessment and vulnerability*
- *Database*
- *Research articles and publications*
- *Implemented actions*
- *…*

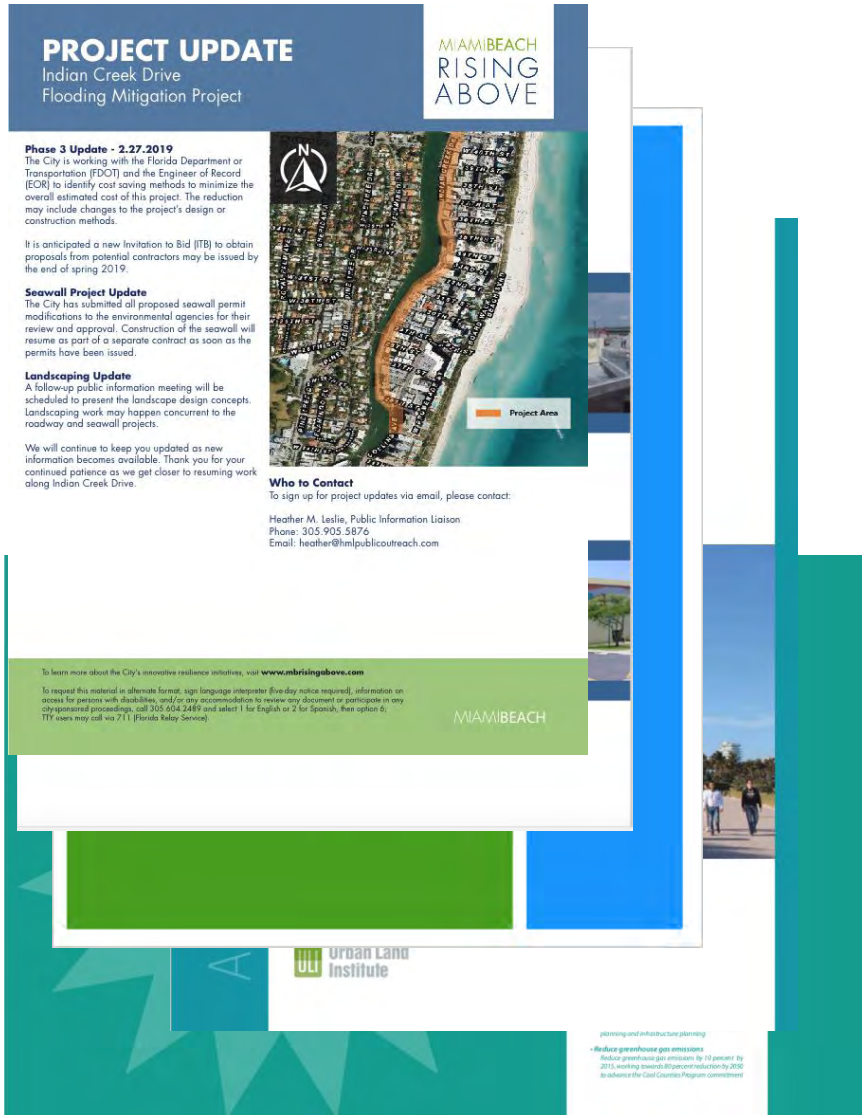
Miami - Adaptation process



<u>Open source documents and data</u>

- *Adaptation plans and strategies*
- *Water management plans*
- *Reports*
- *Risk assessment and vulnerability*
- *Database*
- *Research articles and publications*
- *Implemented actions*
- *…*

Miami - Adaptation process



<u>*Open source documents and data*</u>

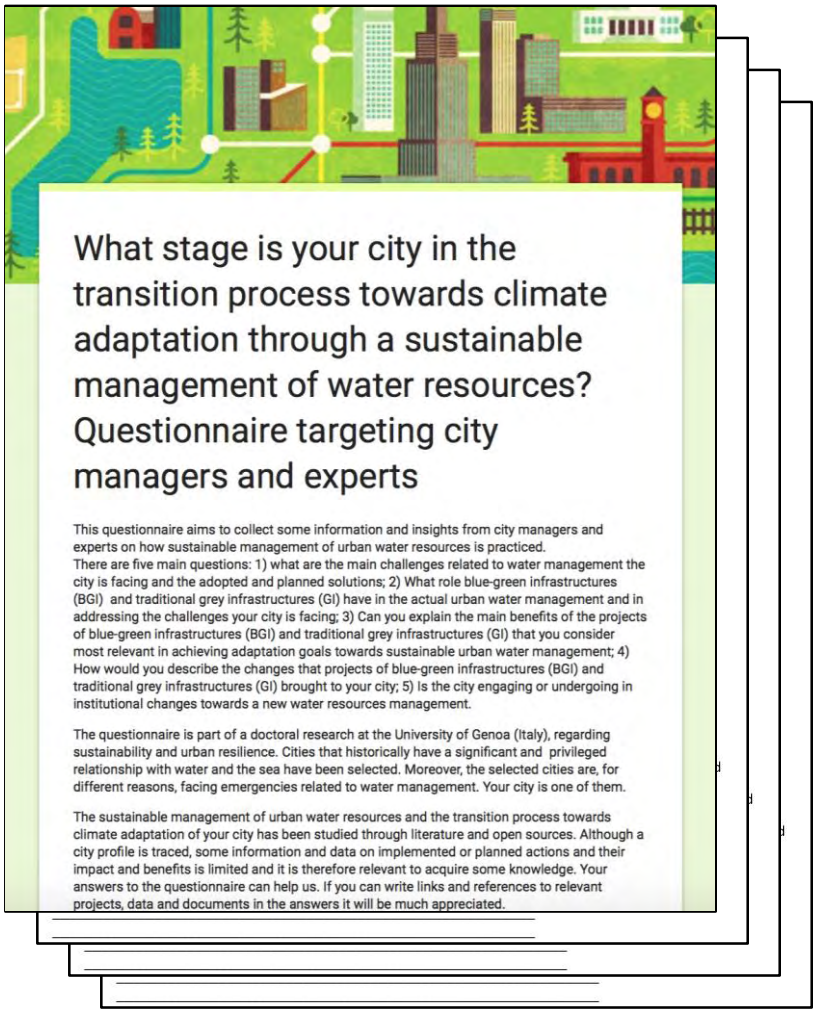
- *Adaptation plans and strategies*
- *Water management plans*
- *Reports*
- *Risk assessment and vulnerability*
- *Database*
- *Research articles and publications*
- *Implemented actions*
- *…*

Miami - Adaptation process

<u>Open source documents and data</u>

- *Adaptation plans and strategies*
- *Water management plans*
- *Reports*
- *Risk assessment and vulnerability*
- *Database*
- *Research articles and publications*
- *Implemented actions*
- *…*

Miami - Adaptation process



<u>Questionnaire</u>

targeting city managers and experts

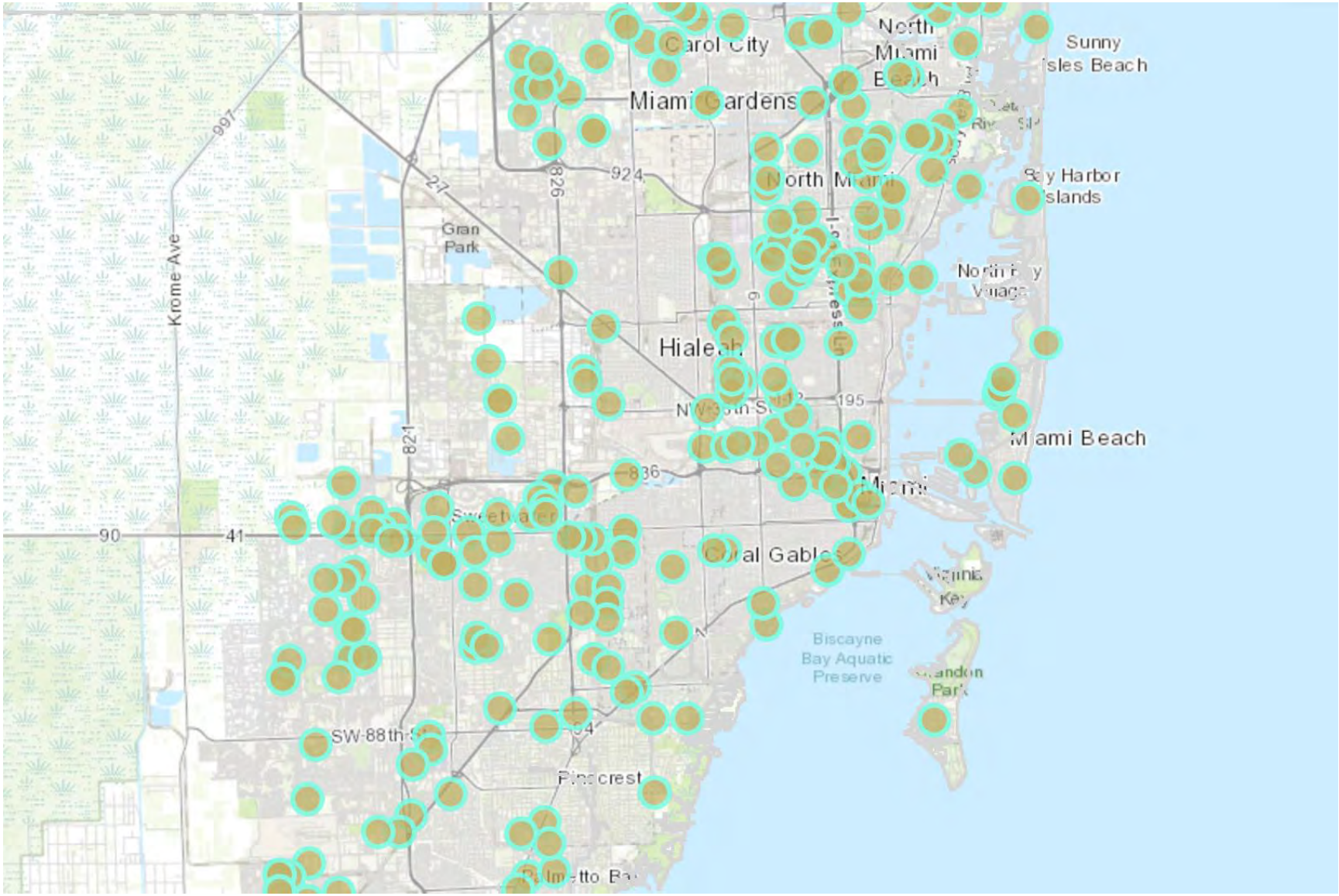
Some key issues:

- the role of blue-green infrastructure and grey infrastructure ;
- what challenges and goals are pursued;
- institutional changes are underway towards a new way of managing water resources;

<u>Semi-structured interviews</u>

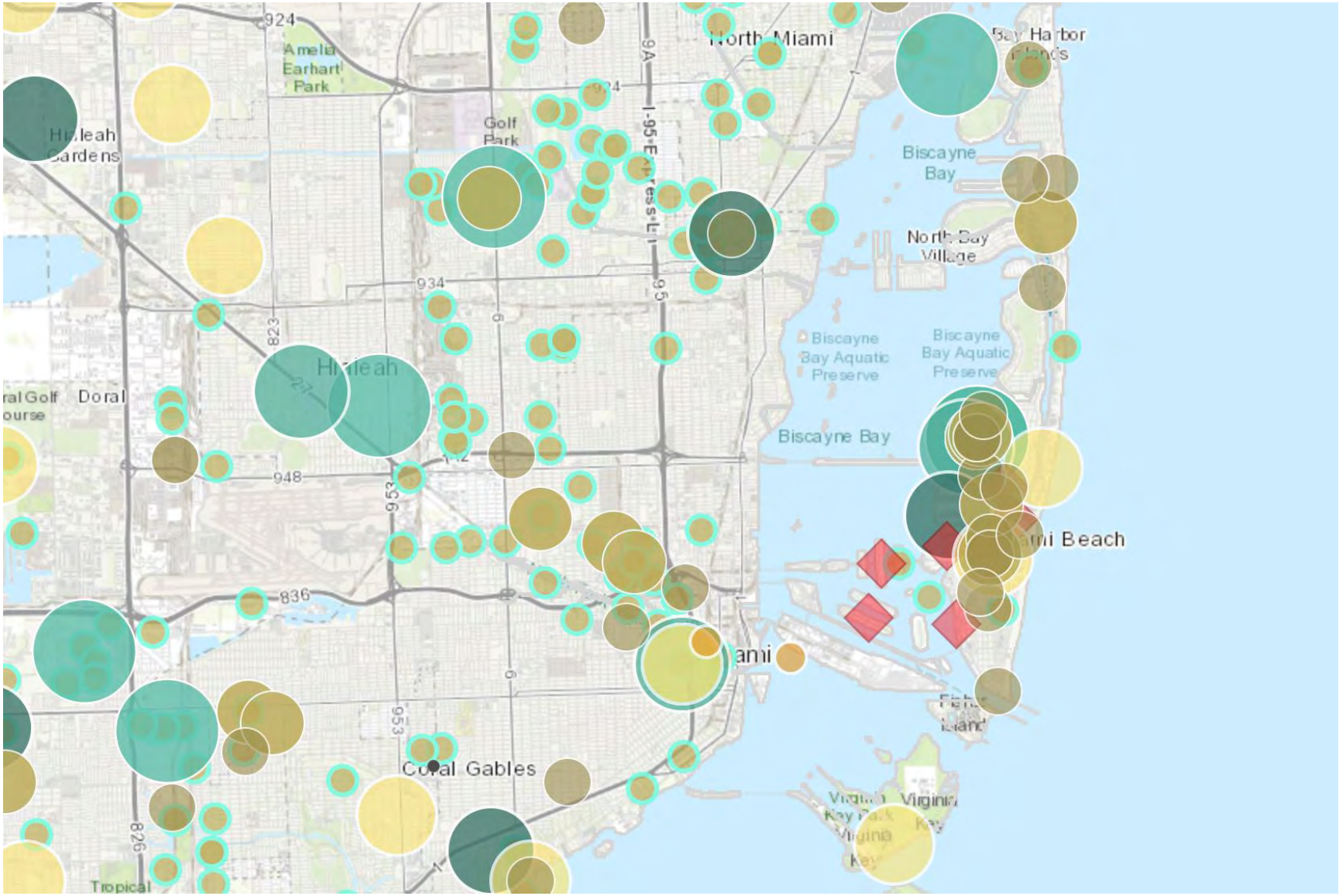
- experts opinion

Miami - Adaptation projects



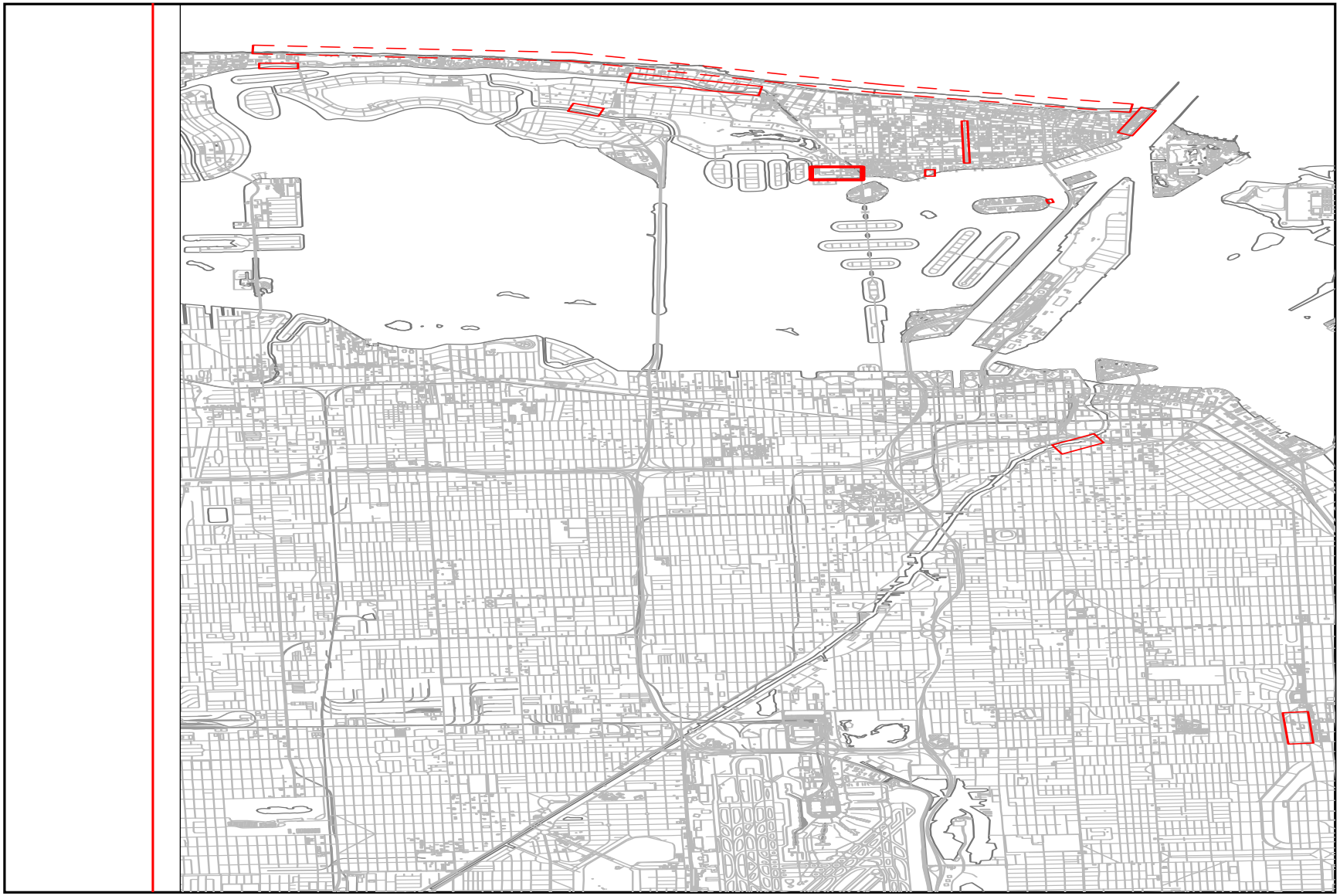
Miami Dade County - Local Mitigation Strategy - LMS projects, project complete

Miami - Adaptation projects



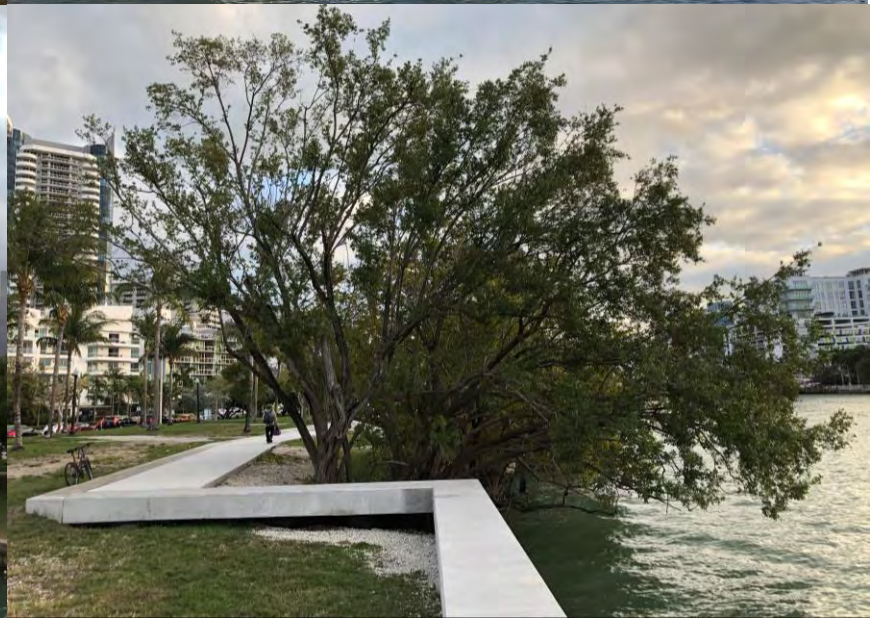
Miami Dade County - Local Mitigation Strategy - LMS projects, project complete and planned

Miami - Adaptation projects

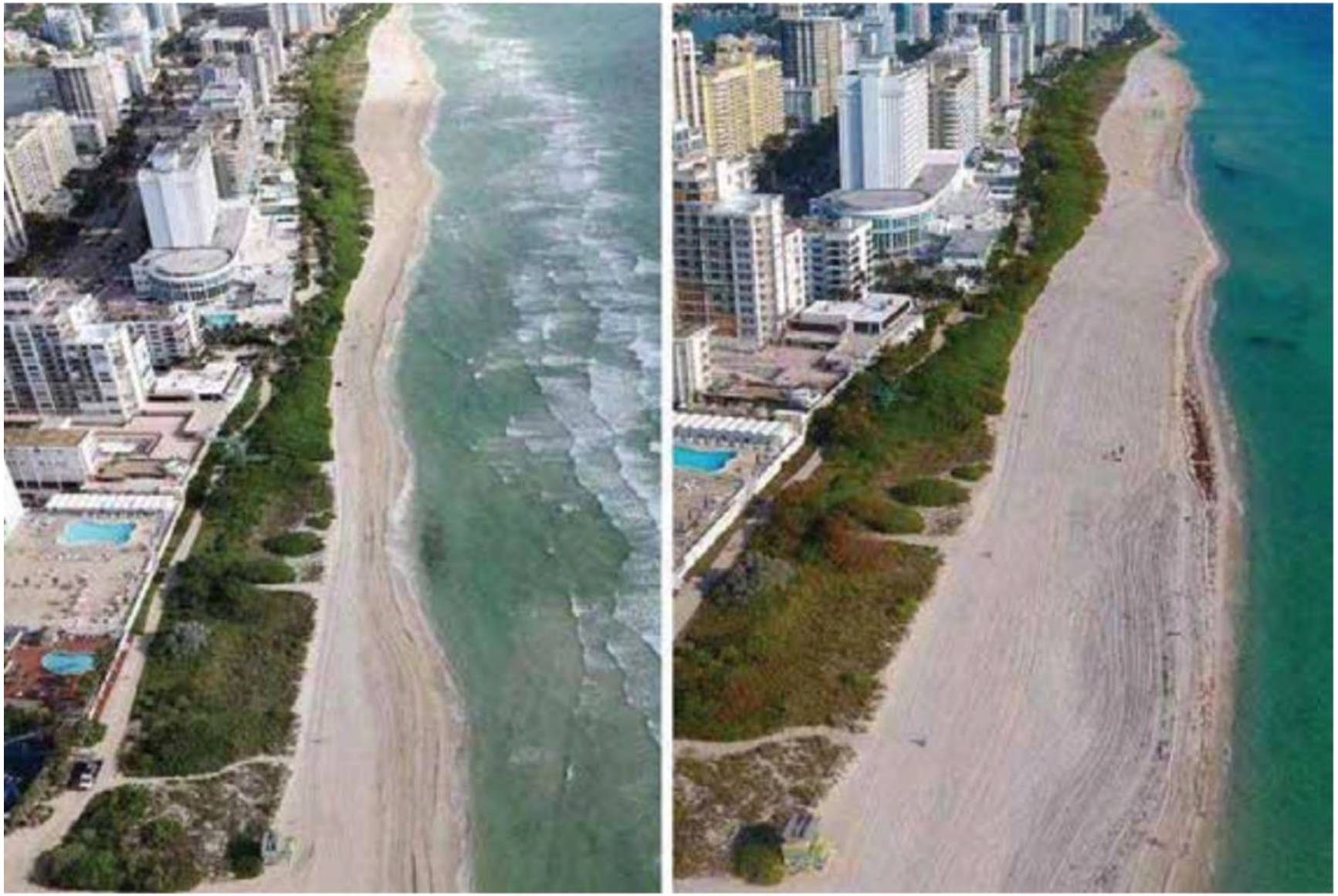


Mapping implemented and planned adaptation projects

Miami

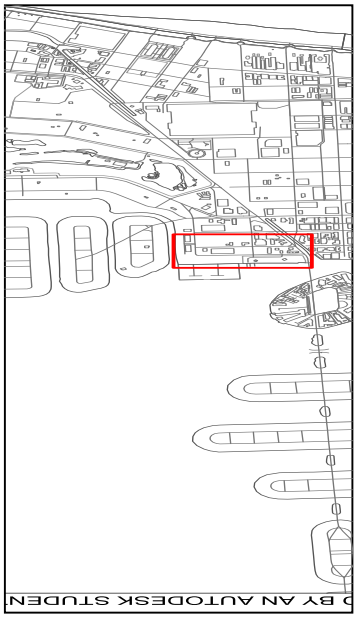


Miami



Solo nel 2016, *Miami Beach Dade County Beach Erosion Control* e *Hurricane Surge Protection*, hanno depositato 18.500 camion di sabbia a Miami Beach. Nelle figure la spiaggia prima (a sinistra) e dopo il progetto di protezione costiera.

Sunset Harbor neighborhood and Maurice Gibb's Memorial Park, Miami Beach



1995

2017

Adaptation approach ☐ Incremental adaptation

Infrastructure ☐ GI + BGI (living shoreline)

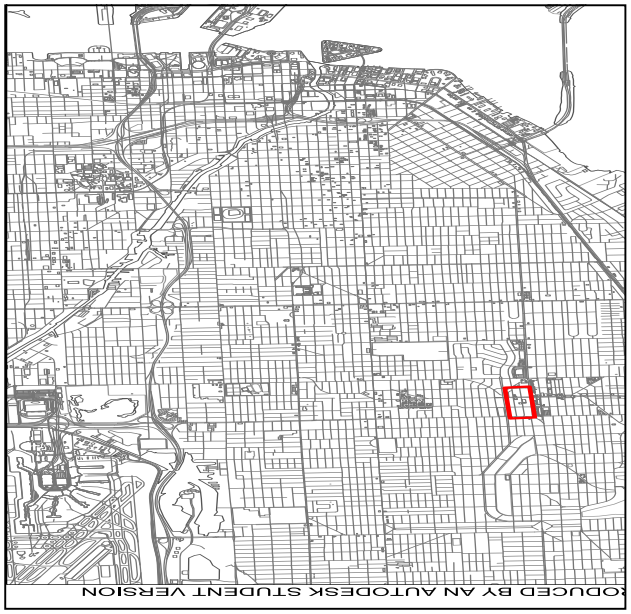
Relation with water ☐ OUT – Reject/repel

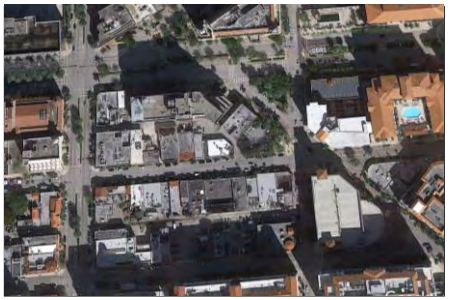
Action ☐ Add (extrusion)

Road elevation, renovated pump station, sea walls, living shoreline.

The Sunset Harbor area of Miami Beach was once plagued by intense flooding during high-tide and storm-water events. The city realized that an action was needed to protect those assets. The result includes one of the city's most ambitious road elevation projects and a buzzing commercial area. The city anticipates that private infrastructure will adapt incrementally along with its own public infrastructure plan.

Giralda Avenue, Coral Gables





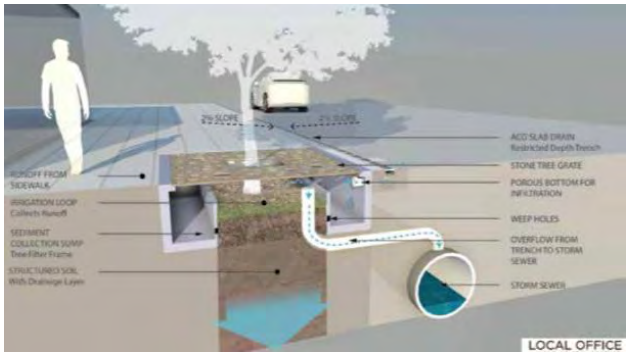
2016

2017

Adaptation approach	☐ Incremental adaptation
Infrastructure	☐ GI + BGI
Relation with water	☐ IN – Absorb/contain
Action	☐ Add + Retrofit/reuse

Storm water and drainage system

In Coral Gables Giralda Avenue was recently completed as part of the Miracle Mile project. The storm water system was designed to withstand rains of 7.5 inches per hour, which far surpasses the code. This system used porous paving, which blends permeable products such as rubber to absorb more water. The project also used hurricane-wind-resistant planting techniques, which plant trees deeper into the ground so as a network they can collectively mitigate groundwater. A testament to structural soil and decentralized line drains, Giralda Avenue recently withstood Hurricane Irma while neighboring streets experienced intense flooding.



Miami

A Permeable Plaza: Giralda Avenue in Coral Gables

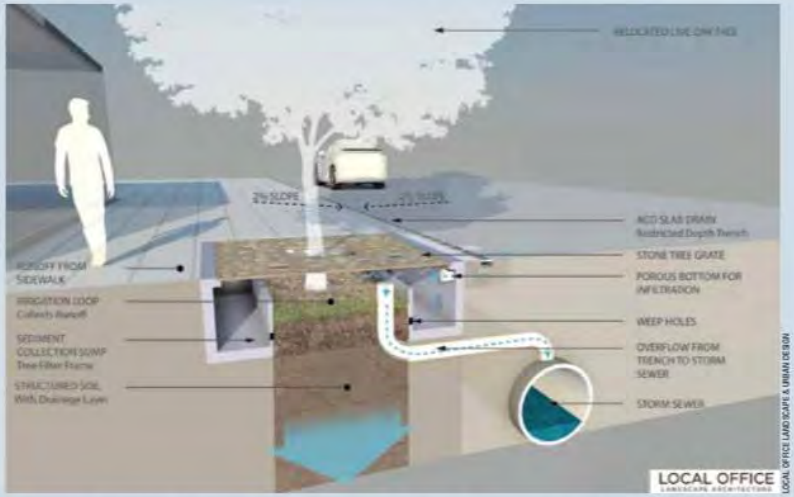
In Coral Gables, Florida, Giralda Avenue was recently completed as part of the city's Miracle Mile project, which spans a total of four blocks. Giralda Avenue, physically divided from the Mile itself, was designed to become a curbless pedestrian plaza. The entire project, designed in collaboration with Local Office Landscape and Cooper Robertson, works to integrate both resilience and art, creating paving patterns that imitate tropical raindrops.[18]

The stormwater system was designed to withstand rains of 7.5 inches per hour, which far surpasses the code. This system used porous paving, which blends permeable products such as rubber to absorb more water. The project also used hurricane-wind-resistant planting techniques, which plant trees deeper into the ground so as a network they can collectively mitigate groundwater. A testament to structural soil and decentralized line drains, Giralda Avenue recently withstood Hurricane Irma while neighboring streets experienced intense flooding. To further synthesize these elements with the streetscape, the project plans to cover stormwater utility boxes in artwork.[19]

LOCAL OFFICE LANDSCAPE & URBAN DESIGN

Giralda Avenue, part of the Coral Gables Miracle Mile district, is a pedestrian plaza designed with resilience in mind.

The $20 million project took years to complete. The city commission, whose membership was evenly split between the city and property owners, initially approved funding in 2014. Property owners in the Business Improvement District paid a special assessment tax dependent on location: 35 percent if directly on the Mile or plaza, and 15 percent if adjacent to it. To help diminish these costs, the city agreed to pay interest for two years and raised parking meter fees to ease parking costs for businesses.[20] The project is a laudable example of integrating several solutions into one, merging economic improvements, artistic elements, and resilience initiatives.



LOCAL OFFICE LANDSCAPE & URBAN DESIGN

The integrated stormwater system is designed to withstand rains of 7.5 inches per hour, surpassing local code requirements.

Houses on stilts, Key Largo, Florida

2009

2017

Adaptation approach Incremental adaptation

Infrastructure GI

Relation with water ABOVE – Suspend

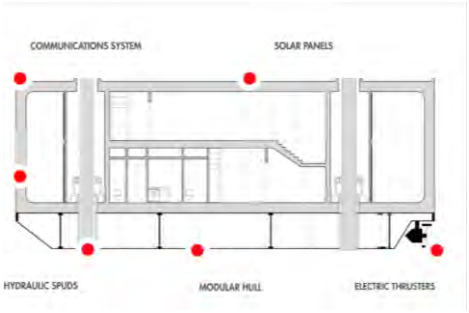
Action Add

Construction of new houses on pillars

In the Keys Islands the development of new buildings is often carried out on pillars with an open ground floor, so that the water can flow under the houses, as happens for example in Queensland in Australia. In Key Largo a new development of 285 permanent, market-rate dwelling units is being built, taking the place of a previous development.

Rene Gonzalez Architect, Prairie Residence, Miami Beach, Florida, US
Source: http://renegonzalezarchitect.com

Floating house, Miami



Adaptation approach ☐Transformational adaptation

Infrastructure ☐ GI + BGI

Relation with water ☐ ON – Float

Action ☐ Add

Prototype of sustainable floating house, designed to resist to hurricane

The first sustainable floating house designed by Arkup, currently anchored to Star Island in Miami Beach, produces its own energy and harvests its own water.
The structure and anchoring system are designed to resist high winds and hurricane force winds (up to 156 mph | 250 km/h – Category 4.) The vessel can be completely lifted out of the water to safe guard from storm surge. Hurricanes are predictable storm events allowing enough time for owners to sail to a safe harbor or a protected area.

Conclusione

L’adattamento ai cambiamenti climatici e alle pressioni a cui le città sono sottoposte può diventare un’opportunità per un nuovo disegno del territorio urbano sostenibile, resiliente, inclusivo.

L'approccio multidisciplinare che ci coinvolge come architetti, urbanisti, pianificatori, paesaggisti insieme ad ingegneri, trasportisti, decisori è fondamentale sia nel processo sia nel progetto di nuovi spazi urbani che siano sostenibili, resilienti, inclusivi.

Grazie per l’attenzione

Arch. Guido Emilio Rossi

guido.e.rossi.unige@gmail.com

XV Seminario Urbanismo Internacional

Ciudad inclusiva
Acciones y proyectos sustentables de la nueva agenda urbana
del 22 al 26 de abril de 2019
Museo Franz Mayer, Ciudad de México